



Quality of Service Business Rules

(Issued Pursuant to the Quality of Service Regulations)

August, 2024

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PART I: GENERAL

1. Introduction

In furtherance to the Nigerian Communications Commission's (NCC) objectives of development and monitoring of performance standards and indices relating to the quality of telephone and other communications services in Nigeria having regard to the best international practice and in line with the Nigerian Communication Act (NCA) 2003 or as may be amended from time to time which vests the NCC with the exclusive right to regulate Communications services, the need to review the existing Quality of Service (QOS) Regulations is necessary taking into consideration of new and emerging technologies and some prevailing operational challenges.

This document sets out the Business Rules for implementation, monitoring and effective Management of Telecommunications Quality of Service by the NCC in Nigeria. Any changes to these Business Rules shall be subject to the change control procedure as presented in the 'Change Control' Section of this document.

2. Definitions

All terms used in the Business Rules have the same meanings as defined in the Nigerian Communications Act, 2003 (the "Act") and the Quality of Service Regulations.

3. Scope of the Business Rules

The Business Rules stipulate the minimum quality and standards of service, associated measurements, and key performance indicators for measuring quality of service.

PART II: THRESHOLD TARGETS AND KPIS

1.0. WIRELINE SERVICES KPIS.

Table 1: Fixed Wireline Telephony Services for End Users

Parameter Name	KPI
Disconnection complaint rate	<0.002% of customers in the Reporting Period
Disconnection complaint resolution time	<1 working day for the mean
Fault report rate	<0.002% of customers in the Reporting Period
Fault repair time	<2 working days for the mean in the Reporting Period
Service supply time	<5 working days for the mean in the reporting period
Other related KPIS which are not stated in this table	Same as that stated in section 2.0 of this schedule

2.0 ACCOUNT COMPLAINT KPIS

TABLE 2 : Account Complaint KPIS		
Ten complaints to every one million bills/accounts		
2.1. Account complaint		KPI Target Resolution time
1.	Charging for line rental at incorrect rate	≤ 5 days
2.	Charging for calls/SMS/MMS messages at incorrect rate or more than once for the same call/SMS	≤ 1 Hour ≤ 24 Hours for Roaming
3.	Charging for services not rendered	≤ 24 Hours
4.	Charging for uncompleted/unsuccessful calls/SMS, or charging for access not rendered	≤ 1 Hour
5.	Charging for calls beyond their duration	≤ 24 Hour

6.	Failed attempts to load recharge payments.	(a) \leq 3 Hours for network related faults (NB. Except for exceptional circumstances that have been made public, each time within 2 hours of occurrence of the failure in the affected area. Each failure in this category that has taken longer than 48 hours to resolve must formally and specifically be communicated to the commission (b) \leq 1 Hour for software related faults
7.	System failure at Contact Centers inhibiting bill payments	\leq 30 Minutes
8.	Failed attempts to check/determine the account balance	\leq 2 Hours
9.	Losing credited amounts from the account.	\leq 1 Hour
10.	Miscellaneous complaint resolution time	\leq 48 Hours
11.	Inability to change tariff plan for qualified subscriber	\leq 24 Hours
12.	Credit deducted but not reflected in the receiving account in case of virtual top-up	\leq 1 Hour
13.	Invalid system response for genuine service request	\leq 2 Hour
14.	Unjustified call-barring/restriction (local, national or international)	\leq 2 Hour
15.	Inability to activate offered service	\leq 2 Hour
16.	Inability to access offered service by a qualified customer on an enable device	\leq 1 Hour
17.	Inability to load credit from an over-scratched card	\leq 1 Hour
18.	Request for blocking of reported lost/stolen SIM card which subscriber ownership has been confirmed	\leq 5 minutes Blocking allowed, and further usage should not be chargeable to the consumer from the moment of filing the report.

19.	Request for PUK code	Should be met within 3 Hours
20.	Inability to send or receive SMS (local or international)	≤ 1 Hour
21..	Inability to retrieve or send voice SMS	≤ 1 Hour
.	Miscellaneous Complaints	KPI Target Resolution Time
22.	Unsolicited messages	(i) The service provider must provide an option for the subscriber to “Opt out” of receiving such messages in case of messages originating from the service provider or its third party business partners. (ii) The service provider should make reasonable effort to identify and block or filter bulk, unsolicited and offensive messages from other sources.
23.	Time for recharge/bill payments to reflect on the account.	≤ 10 seconds recharge from mobile ≤ minutes recharge from Bank Automated Teller Machine (ATM) ≤ 1 Hour over the counter ≤ 10 Minutes after receipt of payment confirmation, for internet-based transaction
24.	Number of complaints upheld Per day related to: (i) wrongly cleared balance (ii) wrong IVS/System response message (iii) failed attempts to determine the account balance (iv) failure to provide agreed content	≤ 10

25	Number of complaints per month related to incorrect settings by a licensee leading to inhibition of two-way communication while roaming internationally.	≤ 10
26.	Meeting advertisement commitment	There shall be no disparity between advertised rates and that eventually received by the consumer
27		
28	Complaints call ID	Each complaint call must be given a unique reference number that identifies its nature/category, for follow up and statistical analysis.
29.	Number of complaints per day related to any of the following : (a) One-way/two-way loss of audio (b) Cross-talk (c) Call misdirection to un-intended number (d) Voice quality	≤ 50 per day
30.	Number of complaints per day in respect of Network-related blocking of incoming calls for any subscriber.	≤ 5
31	Number of complaints per day related to inability to meet SMS/MMS end-to-end delivery time threshold for any subscriber.	≤ 10
32.	Voice-mail related complaints per day	≤ 2
33.	Acknowledgment of delivery of all SMS/MMS/IMS messages sent	= 100% unless deactivated by subscriber
34.	Cost information (end of call notification) for all completed calls or RGE via text to the consumer	= 100% within 5 minutes of hang-up unless deactivated by subscriber or deactivated at his/her behest.
35.	Promotions and games	Rules of participation must be clear and widely published, and promotions shall not lead to breach of any part of these regulations
<i>2.3 Disconnection of subscriber</i>		
36.	Disconnection resolution time	(a) There should be :

I.	Post-Paid	<p>(i) A text notice after reaching 75% of credit limit</p> <p>(ii) On reaching 100% of credit limit a constant IVR notice of credit expiry remains ON for the next 1 week, during which the Operator is at liberty to allow/disallow outgoing calls until debt is settled.</p> <p>(b) If there is dispute, resolution time \leq 24 Hours</p> <ul style="list-style-type: none"> • 1/30th of average monthly spending should be allowed for out-going calls to be used by the customer within the dispute resolution time.
II.	PRE-PAID	<ul style="list-style-type: none"> • A subscriber line may be deactivated if it has not been used, within six (6) months, for a Revenue Generating Event (RGE). If the situation persists for another 6 months the subscriber may lose his/her number, except for Network related fault inhibiting an RGE. • Monies left in account on deactivation can be claimed by subscribers once proof of ownership can be established at any given time within 1 year (less any fee paid by the operator for the number within the 1-year of non-RGE).

		<ul style="list-style-type: none"> • Deduction of Line rental charge (if any) is regarded as an RGE. • A subscriber with a proof of good reason for absence is at liberty to request for line-parking
	III. INTERNET SERVICE	<ul style="list-style-type: none"> • To be restored within 2 hours except for service lawfully disconnected
	IV. Number of complaints received per day by the operator/NCC's consumer Affairs Bureau with respect to the Operator's inability to meet I, II, and III	<p>≤ 10/1 million subscribers</p> <p>≤ 10 for operators with ≤ 1 million subscribers</p>
37.	Credit run-out alert whilst on a call	<p>A single short-beep to the call initiator at :</p> <p>(i) 2 Minutes, and at</p> <p>(iii) 30 seconds to termination of the ongoing call</p> <p>Low credit announcement to be played while the call is being originated in a situation where the call cannot last up to 30 secs.</p>
38.	Credit loading and balance checks	Free of charge; operators must provide options such as by text and/or voice or other means that will support physically challenged persons.
39.	Handset/Recipient Rejected Calls	IVR must be in place to state that the called number does not accept calls from the calling number.
Table 3 : Customer Care Services KPIs		
<i>3.1. Call Centre</i>		
1.	Call Handling	<ul style="list-style-type: none"> • Maximum number of call-attempts before connecting to Customer Care Lines should not be more than three (3) times ;

		<ul style="list-style-type: none"> • Maximum number of rings before a call is answered by either an IVR machine or a live agent should not be more than five (5) ; and • Where a customer decides to speak to a live agent, the maximum duration allowable on the queue/IVR should be 5 minutes before answer. • In exceptional cases where live agent may be unavailable within 5 minutes to answer the call, a customer should be given an option to hanging up to be called back within a maximum time of 30 minutes.
2.	Customer care lines that can be accessible through other networks	≥ 1 free access number and if 1 number then it should accommodate multiple calls at the same time.
3.2. Customer Care Centre		
	Waiting time to be physically attended to by relevant staff at customer care centers	≤ 30 minutes. The Licensee shall provide means of measuring the waiting time, starting from time of arrival at the premises.
TABLE 4 : Network Performance KPIs		
4.1. Network Node Performance		
1.	BH call completion rate	$\geq 97\%$ of attempted calls
2.	Location update success rate	$\geq 99\%$ of attempts
3	Paging success rate	$\geq 98\%$ of attempts
4.	BH TCH Assignment success rate	$\geq 99\%$
5.	HLR/HSS/MS/MGW , BH VLR and other core network capacity utilization	$\leq 70\%$
6	BH BSC and BH RNC capacity utilization	$\leq 60\%$
7.	BH processor loading BH Erlang Utilization/BSc	$\leq 60\%$

8	No. of interconnect points per 3 contiguous covered states (standalone or shared)	≥ 1	
9.	Interference protection ratio	(a) Co-channel C/I ≥ 12 dB (b) Adjacent channel C/I ≥ -12 dB (c) A Licensee must operate within its permitted frequency band without causing harmful interference to parts of its network or network of other licensees.	
10.	Upgrade/Integration/Cut-over related errors	Life-time of any : (a) CIC mismatch, (b) Global Cell Identity- error, (c) Improper neighboring- cell definition Life -time of Error in : (a) Neighboring MSC definition (b) Roaming number of New MSC (c) Exchange parameter settings, including SS-Tone sending (d) IN trigger table definition	Life-time of error in ≤ 1 hour or 12 hrs if it justified to the satisfaction of the commission
11.	Resolution time of BTS faults impacting on traffic	≤ 2.5 hrs Rural ≤ 1.5 hrs Urban Exceptional circumstances such as late night failures in difficult locations must be announced via electronic media covering such location, within 2hrs	
12.	Resolution time of BSC faults impacting on traffic	≤ 45 minutes	
13.	HLR/STP-in-pool implementation	=100%	
14.	Geographical location of HLRs/STPs/SDPs/SCPs	≥ 2 locations	
15.	Resolution time of MSC and other core network node faults impacting on traffic	≤ 10 Min	

	MSC/VLR (MSS) and other core network System Availability (monthly or any other duration as may be determined by the Commission)	$\geq 99.99\%$ of (720Hrs)
		\geq
16.	Mean Time to Repair other failures that affect traffic	≤ 1.5 hours
17.	Service coverage received signal level	Out-door ≥ -80 dBm In-door ≥ -85 dBm In-vehicle ≥ -85 dBm
18.	Signaling (SS7) utilization	$\leq 40\%$ HSL ; $\leq 30\%$ NBL
	Signaling (SS7) Link Availability	$\geq 99.99\%$
	LinkSet Unavailability	$\leq 0.01\%$
19.	Conversational voice quality on ON-NET calls	MOS ≥ 3.6 on the MOS scale
20.	Speech encoding	Use full-rate (FR), enhanced FR, but, specific authorization must be obtained from the commission to use of half-rate whether manually set or automatic through adaptive multirate (AMR), for the specific period of use.
21.	BH SMS delivery success rate for enabled-handsets that are in working order, fit for purpose, ON, and in the service area, assuming sufficient account balance.	$\geq 99\%$ of attempts
22.	SMS end-to-end delivery time for enabled-handsets that are in working order, fit for purpose, ON, and in the service area, assuming sufficient account balance.	≤ 8 seconds for MO and MT switched ON and within the service area (ON-NET) ≤ 10 seconds for OFF-NET
23.	Minimum time for storage of SMS/MMS before deletion by the operator i.e for SMS/MMS that are sent to mobile stations that cannot be reached	30 hours
24.	Maximum time allowed for B-number/routing table to be out-of-date, or problem-resolution and inclusion of omitted numbers	≤ 24 hrs

4.2	Microwave Transmission Path	
1.	Maximum time for transmission/physical link outage	≤ 2 Hours
2.	Percentage of microwave links with space as well as frequency diversity	$\geq 60\%$
3.	BH congestion on trunks	$\leq 0.2\%$
4.	Redundancy on transmission links	Must conveniently handle 100% of the primary link BH traffic. There should not be redundancy on all critical links
5.	Compression ratio on transmission system	$\leq 1:1$, but for any other compression ratio a specific authorization must be obtained from the commission for the specific transmission rout and for a particular period of use.
6.	Error second ratio (ESR)	≤ 0.01 ($\leq 1 \times 10^{-4}$ for IP Traffic)
7.	Background block error ratio (BBER)	≤ 0.00005 ($\leq 1 \times 10^{-6}$ for IP traffic)
8.	Severely error seconds (SESR)	≤ 0.02 ($\leq 1 \times 10^{-5}$ for IP traffic)
9.	Availability	$\geq 99.99\%$
10.	Delay	$\leq 50\text{ms}$
11.	Average delay	$\geq 29\text{ms}$
12.	Delay variation	$\leq 5\text{ms}$
13.	Packet loss	$\leq 1\%$
14.	Slip	$\leq 5\%$
4.3.	Synchronization Network (Node Output)	
1.	Primary reference clock (PRC)	MTIE = $25 + 0.275T$ ns {T = 900s} TDEV ≤ 3 ns
2.	Synchronization supply unit (SSU)	MTIE = 2000 ns TDEV ≤ 3 ns
3.	SDH equipment clock (SEC)	MTIE = 250 ns
4.	PDH synchronization interface	MTIE = 2000 ns TDEV ≤ 34 ns

S/N	KPI	TARGET	COMMENT
	The General KPIs		
1	Percentage of cells reporting QoS data for each KPI	≥97% of cells reporting for 98% of the days of the month or any other duration as may be determined by the Commission	
2	Percentage NCC QoE applets registered in QoS Infrastructure Tool Server	≥98%	Percentage of Applets allocated per MNO
	Threshold for 2G Network		
3	BH Traffic Channel (TCH) Congestion	≤1.5% measured at BSC level ≤1% measured at Cell level	Matters outside the control of operators and escalated to the Commission will be taken into consideration by the Commission
4	BH SDCCH Congestion (measured at BSC)	≤0.4%	
5	BH SDCCH Congestion (measured at Cell levels)	≤0.2%	Matters outside the control of operators and escalated to the Commission will be taken into consideration by the Commission
6	BH CSSR (measured Cell levels)	≥ 98.5%	Matters outside the control of operators and escalated to the Commission will be taken into consideration by the Commission
7	BH CSSR (measured BSC level)	≥ 98%	
8	BH Drop Call Rate (measured cell level)	≤ 1%	Matters outside the control of operators and escalated to the Commission will be taken into consideration by the Commission
9	BH Drop Call Rate (measured BSC level)	≤ 1.5%	
10	BH Handover Success Rate	≥ 98%	
11	BH Paging Success Rate	≥ 97%	
12	MOS	90% of Samples ≥ 3	DT (POLQA)

13	Call Setup time	≤ 6 sec	
14	Cell Availability	$\geq 98.5\%$	
	Threshold for 3G Network		
1	Call Setup Success Rate (PS)	$\geq 98\%$	
2	Call Setup Success Rate (CS)	$\geq 98\%$	
3	RRC connection establishment success rate (PS)	$\geq 98\%$	
4	RRC connection establishment success rate (CS)	$\geq 98\%$	
5	RAB Establishment Success Rate	$\geq 98\%$	
6	HSUPA Setup Success Ratio [%] for Streaming(S), Interactive(I) and Background(B) Services	$\geq 98\%$	
7	HSDPA Setup Success Ratio [%] for Streaming(S), Interactive(I) and Background(B)	$\geq 98\%$	
8	Iub Congestion	$\leq 1\%$	
9	RRC Congestion	$\leq 0.5\%$	
10	Circuit Switched RAB Congestion	$\leq 1\%$	
11	Paging Success Rate	$\geq 97\%$	
12	CS RAB Abnormal Release Rate	$\leq 1.5\%$	
13	PS RAB Abnormal Release Rate	$\leq 1.5\%$	
14	Soft Handover Success Rate	$\geq 98\%$	
15	Inter RAT Handover Success Rate for CS Domain	$\geq 97\%$	
16	Cell Availability (or Node-B Accumulated downtime (not available for service))	$\geq 98.5\%$ $(\leq 1.5\%)$	
17	Average Downlink Throughput per User	≥ 1.50 mbps	To be measured via Drive Test and FTP service
18	CS Call setup time (CST) for on-net calls	≤ 6 sec	
19	CS Call setup time (CST) for on-net calls	≤ 6 sec	
20	MOS	90% of Samples ≥ 3.5	DT (POLQA)
	Threshold for 4G Network		
1	Cell Availability	$\geq 98.5\%$	
	Call Setup Time	≤ 5 sec	
2	CSFB CST	≤ 8 sec	
3	CSFB Preparation Success Rate	$\geq 98\%$	

4	ERAB Set up Success Rate	≥98%	
5	RRC Set up Success Rate	≥99%	
6	ERAB Drop Rate	≤ 1%	
7	E – UTRAN Downlink User Throughput (Mbps) per user	≥20 Mbps	To be measured via Drive Test and FTP service
8	E – UTRAN Uplink Throughput (Mbps) per user	≥5 Mbps	Monitoring. To be measured via Drive Test and FTP service
	Latency	50msec	
9	LTE HOSR (Inter Cell/Inter Frequency)	≥98%	
10	Mean Session Utilization	≤70%	Monitoring
11	MOS	90% of Samples ≥ 3.6	DT (POLQA)
12	SRVCC		Monitoring
	5G KPIs		
13	Latency	≤ 1 ms	Monitoring
14	Download throughput	≥ 100 mbps	Monitoring
	Upload Throughput	≥ 25 mbps	

Table 5 Internet Service Provider’s (ISP) KPIs

	KPI	TARGET	COMMENT
1	LATENCY		
	Metro Latency	≤ 10ms	
	Long Distance Latency	≤ 40ms	
	International Latency	≤ 120ms	
2	AVAILABILITY	≥ 98%	
3	PACKET LOSS	≤ 1%	
4	JITTER	± 10% of latency	
	Metro Latency	± 1ms	
	Long Distance Latency	± 4ms	
	International Latency	± 12ms	
5	LINK UTILIZATION	≤ 80%	
	Download THROUGHPUT	≥ 2mbps	
7	upload THROUGHPUT	≥ 5 mbps	

Note:

- i. Different combinations of the above will be utilized for different categories of licensees that offer data services either as service to subscribers, or wholesale bandwidth providers to other resellers.
- ii. Throughput for 5G services to be measured via Drive Test and FTP service.

In computing the KPIs, the following will apply:

1. The busy hour (BH) will be as specified by the Commission. Some examples include Network Busy Hour, Cell Bouncing Busy hour etc

2. All counter data reporting periods shall be 1 hour
3. The average values to utilize in computing the KPI performance will be as specified by the Commission. Some example of averages include Arithmetic Average, Weighted Average etc.
4. Harmonized formula across vendors will be utilized.
5. Harmonized counters across vendors will be utilized.
6. General KPIs will be used to determine the integrity of the KPI data collected or reported
7. For availability KPIs, a multiplication factor as defined in paragraph 3.0 will be applied for hub sites availability computation.

3.0 COLOCATION PROVIDERS KEY PERFORMANCE INDICATORS (KPI)

	KPI	Target	Comment
1	Power Availability	$\geq 99.5\%$	A multiplication factor (between 1.00 to 1.0049) to be determined will be applied for hub sites
2	Mean Time to Repair	≤ 2.5 hours	A multiplication factor (< 1) to be determined will be applied for hub sites

Note: Weighting for over-all performance per KPI will be as determined by the Commission taking into consideration performance for hub sites and terminal sites respectively.

4.0 QUALITY OF SERVICE INDEX

In order to assess the performance of mobile operators in Nigeria, an aggregation measure called the Quality of Service (QoS) Key Performance Indicator (KPI) (QoS KPI Index) will be developed. The QoS KPI index will combine various QoS KPIs published by the Nigerian Communications Commission (NCC) to provide a comprehensive metric that can assess the quality of service across different generations of mobile networks (2G, 3G, 4G and 5G). This will provide a unified and easily interpretable performance measure that can facilitate effective Quality of Service assessment of telecommunications service providers by subscribers. The QoS KPI Index will aggregate the KPIs for voice, data, and SMS, for different technology generations (2G, 3G, 4G, 5G) and across generations and services.

5.0 POINT OF INTERCONNECT KPIs

	KPI	Target	Comment
1	ASR Incoming	≥35%	35% for MNOs and ICHs and 40% for PNLs/fixed line
2	ASR Outgoing	≥35%	35% for MNOs and 40% for PNLs/fixed line
3	Congestion Incoming	≤0.5%	
4	Congestion Outgoing	≤0.5%	
5	Utilization	≤70%	
6	Route Availability	≥99.99%	

A. 6.0 ESCALATION MATRIX FOR MAJOR OUTAGES

S/N	NUMBER OF IMPACTED SITES	MEDIUM OF COMMUNICATION
1	50≤Sites<100	Email, SMS
2	100≤Sites<150	Email, SMS, Phone Call
3	150≤Sites<300	Email, SMS, Phone Call,
4	Sites≥300	Email, SMS, Phone Call, letter (scanned)

7.0 EXTERNAL ENVIRONMENTAL INTERFERENCE

External environmental interference is outside the control of licensees and requires NCC's intervention to resolve. However, internal interference is within the control of licensees and 4hour resolution time shall apply.

8.0 NUMBER OF SUBORDINATE SITES DEPENDENT ON HUB SITES

Maximum number of subordinate sites dependent on a Hub site shall be less than or equal to 10 (ten) or otherwise as specified by the Commission from time to time.

PART III: REPORTING PRIORITISATION LIST

To ensure compliance with the QoS Regulations, 2024 and for proper monitoring on a reporting area basis, the Commission will categorize the various reporting area into 3 designated priority groups. A list of Reporting Areas which shall be subject to the additional rules to be issued by the Commission will be communicated to Licensees

S/N	REPORTING AREA	REPORTING PRIORITY	COMMENT
1	LAGOS	1	
2	OGUN	1	
3	ABUJA	1	
4	OYO	1	
5	KANO	1	
6	KADUNA	1	
7	RIVERS	1	
8	DELTA	1	
9	ANAMBRA	1	
10	EDO	1	

S/N	REPORTING AREA	REPORTING PRIORITY	COMMENT
1	IMO	2	
2	NIGER	2	
3	OSUN	2	
4	ABIA	2	
5	ENUGU	2	
6	ONDO	2	
7	AKWA-IBOM	2	
8	BENUE	2	
9	PLATEAU	2	
10	ADAMAWA	2	
11	KATSINA	2	
12	KWARA	2	
13	KOGI	2	
14	NASARAWA	2	
15	BAUCHI	2	

S/N	REPORTING AREA	REPORTING PRIORITY	COMMENT
1	BORNO	3	
2	TARABA	3	
3	CROSS RIVER	3	
4	SOKOTO	3	
5	KEBBI	3	
6	GOMBE	3	
7	EKITI	3	
8	YOBE	3	
9	EBONYI	3	
10	ZAMFARA	3	
11	JIGAWA	3	

- a. That, Mobile Service Providers shall submit QoS data on a Reporting Area basis at the cell level to enable the Commission review its threshold. The mechanism of reporting the QoS data shall be as determined by the Commission
- b. That, Mobile Service Providers shall comply with the prioritization of Reporting Areas and KPI set for the Reporting Areas.
- c. That, Mobile Service Providers shall meet the KPI targets in all of the Priority I Reporting areas. That, Mobile Service Providers shall meet the KPI targets in at least 80% Priority 2 Reporting areas.
- d. That, Mobile Service Providers shall meet KPI targets in at least 70% Priority 3 Reporting Areas.
- e. That, Mobile Service Providers shall meet KPI targets at the national level. That failure to meet the specified KPI targets in any Priority 1 , Priority 2 or Priority 3 Reporting Areas for the last 90 (Ninety) days prior to the KPI assessment will result in applicable regulatory action,

PART IV: DEFINITION OF TERMS AND PARAMETERS

The following terms shall convey the meanings ascribed to them hereunder in the context of these regulations. Formula-based definitions can be implemented using the formula specified hereunder or formula with similar effect (should the counters specified not be directly available). All KPIs must be achieved by pre-and post-paid services.

1. Call: A generic term related to the establishment, utilization and release of connection.
2. Call attempt: an attempt to achieve to a connection to one or more devices attached to a telecommunication network.
3. Successful call: A call that has reached the desired number and allows conversation to proceed.
4. Busy Hour (BH): The continuous 1 – hour period lying wholly in the time interval concerned (usually 24hrs) for which the traffic or number of call attempts is greatest.
5. Call completion rate = $CSSR * (1 - TCHDropRate)$
6. Location Update Success Rate (Registered and non-registered subscribers)
7. Paging Success Rate = $(NPAGIRESUC + NPAG2RESUC) / (NPAGILATOT + NPAGIGLTOT) * 100$ [%]
8. Call Setup Time (Post Dialing Delay): Time interval between the end of dialing by the user and the reception by him of the appropriate ring-back tone or recorded announcement, or the abandonment of the call without a tone.
9. Interconnect Circuit (Pol) Congestion: This is the percentage congestion of the Interconnect Circuits measured at busy hour.

$$\frac{\text{Total Number of unavailable Pol circuit requests}}{\text{Total Number of available Pol circuits}} \times 100$$

10. Processor Load: This is the percentage of MSC Processor Workload measured at busy hour.
 - I. BHHIR, MSC Utilization: % Capacity Utilization VLR and MSC at busy hour.
 - II. Transceiver Unit (TRX) Utilization: % Capacity Utilization of TRX at busy hour.
11. No. of Interconnect points per zone: Is the existence of at least one interconnection point per zone.
12. Interference Protection Ratio: Is the interference protection due to Co-Channel and Adjacent Channels.
13. Resolution Time of CIC mismatch: Is the time taken to resolve a CIC mismatch.
14. Resolution time of BTS faults impacting on traffic: This is the time taken to resolve faults that hinder traffic flow in the BTS.
15. Resolution time of BSC faults impacting on traffic: This is the time taken to resolve faults that hinder traffic flow in the BSC.
16. Resolution time of MSC faults impacting on traffic: This is the time taken to resolve faults that hinder traffic flow in the MSC.
17. Time to repair other failures that affect traffic: Time taken to repair other failures (not specifically captured in other parts of this document) that affect traffic.
18. Maximum time for Transmission/Physical link outages: Is the Maximum time allowed for transmission/Physical link to remain in a failed state or state of operation that negatively affects services to consumers.
19. Service Coverage in cities/towns: Is the measured Radio Signal Level in urban and sub-urban areas, in-door and out-door and in moving vehicles in
20. Percentage of Radio Links with Space and Frequency Diversity: Is the percentage of Microwave Transmission Links employing Space and Frequency diversity in the entire transmission network.
21. Conversational Voice Quality: Is the Mean Opinion Score (MOS) of the speech quality perceived by Caller or Called party in accordance with ITU-T P.862.
22. Compression Ratio: Is the compression ratio on the transmission network.

23. Voice Encoding: Is the type of voice encoding that is used on the radio network.

24. SMS Delivery Success Rate: Is the ratio of the failed SMS to the total number of delivered SMS at busy hour if the recipient is active and in coverage area.

$$\frac{\text{Number of SMS received by recipient}}{\text{Total Number of SMS sent to the recipient}} \times 100$$

25. SMS End-to-End Delivery time: Is the maximum End-to-End delivery time of SMS if the recipient is active and the area.

26. Number of Complaints per day related to:

(i) One way or both way loss of audio: A situation whereby either caller or called party cannot hear the audio message or both could not hear each other.

(ii) Cross-Talk: A situation whereby unintended conversation interferes with that of caller or called party or both.

(iii) Call Misdirection to unintended number: A situation whereby a call is terminated at unintended destination.

(iv) Voice Quantity: Conversation with bad speech quality.

27. Number of complaints per day in respect of Network blocking of incoming calls: Number of complaints received per day in respect of blocking of incoming calls in the network.

28. Number of complaints per day related to inability to meet SMS/MMS End-to-End Delivery Time Threshold: Complaints per day received on the network related to inability to meet SMS/MMS delivery time.

29. SMS Delivery Failure Rate: This is the ratio of SMS undelivered to recipient to the total number of SMS received at the Service Center for the recipient.

$$\frac{\text{Number of SMS to recipient undelivered}}{\text{Total Number of SMS received at Service Center}} \times 100$$

30. Voice Mail related complaints per day: The complaints related to voice- mail received per day.

31. Acknowledgement of delivery of SMS/MMS/IMS messages sent: Successful delivery acknowledgement of SMS/MMS/IMS messages sent must be received by the sender for all messages delivered.

32. Cost information for all completed calls or Revenue Generative Events (RGE) via text to consumer: Charging information must be communicated to the consumer for all calls and RGEs on the network.
33. Circuit Switched Data Services (CDS): Upstream/Downstream throughput of Circuit Switched Data Services. Greater or equal to 95% of the agreed data rate must be delivered to customer at busy hour.
34. Packet Switched Data Services (PDS): Upstream/Downstream throughput of Packet Switched Data Services. Greater or equal to 95% of the agreed data rate must be delivered to customer at busy hour.
35. CIC: Circuit Identification Code.
36. RGE: Revenue Generating Event (RGE) is any action by one or more subscribers that leads to Revenue being derived directly or indirectly by one or more operators. **RGE are the following actions:**
 - I. Outgoing and Incoming voice Calls;
 - II. Subscription to any voice plan or any plan that gives voice access to a subscriber for a specific time period;
 - III. Outgoing and Incoming SMS and MMS;
 - IV. USSD transactions;
 - V. Value Added Service (VAS) transactions;
 - VI. Mobile Data Usage;
 - VII. Data subscription or subscription to any plan that includes data access for a specific time period;
 - VIII. Line Rental Payment or any payment incidental to a subsisting subscription for service or access to service;
 - IX. Parked Numbers;
 - X. Subscriber who utilizes/shares of another Subscriber's data services.

It shall be noted that RGE excludes:

- I. Recharge by any means that is not followed up by any of the defined activities above;
- II. Receipt of transferred recharge from any subscriber or the network provider without any follow up activity as listed above;
- III. Failed attempts to make calls or download/upload data that has not been charged by the network provider;

IV. Transactions from barred Subscribers (Full Network barring) due to non-compliance to the Registration of Communication Subscribers Regulations during the reporting period;

V. Subscribers who have ported out of MNO's network during the reporting period.

37. MSC/VLR, MSS System Availability/Down Time: Amount of time the MSC and MSC-S were in/out of service during a given period excluding planned outage. Obtainable from system logs.

38. Signaling (SS7) Link Availability: Availability for ETSI SS7 signaling network, evaluated as:
 $(ASLDUR / (ASLDUR + UNAVAILDUR)) * 100$

39. Signaling (SST) LinkSet Unavailability: Duration of unavailability of signaling link set in seconds, evaluated from: STUNADURAT

40. Answer Seizure Ratio (ASR): Answer/Seizure ratio (ASR) is the number of successfully answered calls divided by the total number of calls attempted (seizures) multiplied by 100. It is evaluated as follows:

Number of B answers in the Incoming route

$ASR_{IN} = (ANSWERSIN / CALLSI) * 100$ Number of B answers in the Outgoing route

$ASR_{OUT} = (NANSWERSO / NCALLSO) * 100$

Number of calls answered (B-answer) for both outgoing and Incoming calls
 $ASR_{TOT} = ((NANSWERSI + NANSWERSO) / (NCALLSI + NCALLSO)) * 100$

41. Background Block Error Ratio (BBER): The ratio of Background Block Errors (BBE) to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during Severely Error

Seconds (SEs). It is expressed as:

$BBER = (BBE / (TEUAS - SES))$

TT Total Measurement Time

UAS Unavailable Second

42. Error Second Ratio (ESR): The ratio of Error Second (ES) to total seconds in available time during a fixed measurement interval. It is expressed as:

$$ESR = [ES / (T \cdot UAS)]$$

43. Severely Error Seconds (SESR): SESR is a one-second period that contains over 30 percent error blocks or at least one defect. SES is a subset of ES. It is expressed as:
$$SESR = [SES / (T \cdot UAS)]$$
44. RTWP – Received Total Wideband Power
45. RSCP-Received Signal Code Power
lub Transmission Interface
Ec/Io-Chip Energy per Interference Spectral Density
46. CS_IRAT HHO Failure - Circuit Switch Inter Radio Access Technology Hard Handover Failure
47. PS IRAT HHO Failure-Packet Switch Inter Radio Access Hard Handover Failure
48. Cell-Emission coverage area of a cell site Technology
49. A CELL SITE is a term used to describe a site where antennas and electronic communications equipment are placed, usually on a radio mast, tower or other high place, to create a cell in a cellular network.
50. BASE TRANSCIVER STATION (BSc) also referred to as the radio base station (RBS), node B (in 3G Networks), eNB (in LTE Standard) or, simply, the base station (BS) is a piece of equipment that facilitates wireless communication between user equipment (UE) and a network.
51. BASE STATION CONTROLLER (BSC) is equipment that provides the intelligence behind the BTSs. It has tens or even hundreds of BTSs under its control. The BSC handles allocation of radio channels, receive measurements from the mobile phones, and controls handovers from BTS to BTS.
52. The Mobile Switching Center (MSC) is the primary service delivery node for GSM/CDMA, responsible for routing voice calls and SMS as well as other services. It has a number of BSCs under its control. The MSC sets up and releases the end-to-end connection, handles mobility and hand-over requirements during the call and takes care of charging and real time pre-paid account monitoring.
53. 3G refers to Third Generation
54. LTE refers to Long Term Evolution Pol: Point of Interconnect

55. General packet radio service (GPRS): is a packet oriented mobile data service on the 2G and 3G cellular communication systems.
56. Enhanced Data rates for GSM Evolution (EDGE) (also known as Enhanced GPRS (EGPRS): is a digital mobile phone technology that allows improved data transmission rates as a backward-compatible extension of (Global System for Mobile Communications (GSM).
57. Network Segment: is an identifiable part of a Telecommunications Network such as BTS, BSC, MSC, Interfaces, etc.
58. Core Network : the component of a Telecommunications Network involve in call processing functions apart from base stations and Business support subsystems.
59. High Speed Packet Access (HSPA) is an amalgamation of two mobile telephony protocols, High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access (HSUPA) that extends and improves the performance of existing Wideband CDMA (WCDMA) protocols.
60. Latency: Network latency is the amount of time it takes for a data packet to go from origin to destination
61. Jitter: is the time delay between when a signal is transmitted and when it is received
62. Additional Terms and Parameters (See Appendix 1,2,3 and 4)

PART V: CHANGE PROCESS

- i. Proposed amendment to this Business Rules should be an outcome of the Technical Sub-committee of the Quality of Service Industry Working Group.
- ii. Proposed amendments to the current document should be submitted to the Steering Group (SG) in advance of the next planned meeting. It is recommended that proposed amendments include the following information: Originator, date originated, proposed change (including textual amendments to the document), benefits of change, objectives of change, risk if the change is not implemented, assessment of scope of work and proposed implementation date.
- iii. Proposed amendment requests will only be considered by the SG if the originator is a service provider in Nigeria or the NCC. Any proposed amendment requests originated by other third parties should be referred to the NCC for consideration and if the NCC views the requests as appropriate, the NCC will refer the request to the SG in accordance with the terms of the change control provisions.

- iv. It is desirable that amendment requests be circulated to the SG members for consideration at least ten (10) working days prior to the next planned meeting of the SG. If no meeting is planned within a month of receipt of the request an ad hoc meeting should be called to discuss the proposed amendment.
- v. Attendance at the SG to discuss proposed agreement amendments is open to all service providers or their representatives.
- vi. Amendment requests will be debated in the relevant SG meeting and accepted or rejected by consensus or majority voting in accordance with the following rules: (a) A voting quorum will be achieved, provided each of the service providers has received a minimum of ten (10) working days advance notice of the meeting and a majority of the service providers are present. The quorum should be deemed formed, only when there are at least six (6) mobile and collocation service providers, (b) One vote for each of the Nigeria mobile service provider present at SG meetings will apply. (c) In the absence of a consensus view, majority voting will apply. (d) For the avoidance of doubt, voting rights shall only be exercisable by mobile service providers and other members of the SG with at least 10% market share in their respective segments. At the NCC's sole discretion, voting rights may be extended to other appropriate stakeholders, including Fixed Service Providers, Internet Service Providers, International Gateway Operators, Collocation Service Providers, Aggregators, Interconnect Clearing Houses, and Value-Added Service Providers.
- vii. All recommendations and decisions agreed by the SG will be referred to the NCC for final review and approval. For avoidance of doubt, SG recommendations and decisions can only be actioned and implemented once formal written approval from the NCC has been granted. The NCC will communicate its decision within two (2) weeks of receipt of the outcome of the SG deliberations.
- viii. When amendments are approved by the NCC this document will be reissued as appropriate.
- ix. It is the responsibility of the SG Chairperson, at the meeting where the change is agreed, to ensure that accepted changes are incorporated into the Business Rules and the updated document is re-issued in a timely manner to the members of the SG.
- x. The QoS Steering Group members shall be drawn from the Commission, Senior Management or representatives of the Mobile Network Operators, Fixed Service Providers, Internet Service Providers, International Gateway Operators, Interconnect Clearing Houses, Aggregators, Collocation Service Providers and one representative of Value-Added Service Providers

S/N	KPIs	Meaning
38	HTTP	Hyper Text Transfer Protocol
39	CSSR	Call Set Up Success Rate

APPENDIX 1

APPENDIX 2

Ericsson KPI counters

Technology	KPI	Formula	KPI Counter
2G	CSSR	CSSR=Immediate Assignment Success Rate * Success Rate of TCH Assignment * (1-SDCCH Call Drop Rate) * 100%	$(1-(\text{CNDROP}-\text{CNRELCONG}-\text{CLUNDROP}) / (\text{CMSESTAB}-\text{CLUMSESTAB})) * (\text{TCASSALL}) / (\text{TASSALL})$
	SDCCH Cong	(Nr of SDCCH Allocation Failures (Due to Congestion))/Nr of SDCCH Allocation Attempts)*100	$100 * (\text{CCONGSSUB}/\text{CCALLS})$
	Drop Call Rate	(Nr of TCH HR Drops / Nr of TCH HR Assignment Successes (Excluding Handover)) * 100	$((\text{CNDROP}-\text{CNRELCONG})/\text{CMSESTAB}) * 100$
	TCH Congestion	Congestion Rate (TCH) = (Number of Failed TCH Assignments and handovers due to Congestion / Number of TCH Seizure Requests) x 100% = $\frac{\sum(\text{E}///_ \text{CONG_TCH_NUM})}{\sum(\text{E}///_ \text{CONG_TCH_DENOM})} * 100\%$ <p>1. $\text{E}///_ \text{CONG_TCH_NUM} = (\text{TFTCONGS} + \text{TFTCONSUB} + \text{THTCONGS} + \text{THTCONSUB})$</p> <p>2. $\text{E}///_ \text{CONG_TCH_DENOM} = (\text{TFMSESTB} + \text{THMSESTB})$</p>	$(\text{CNRELCONG} + \text{TFNRELCONG} + \text{TFNRELCONGSUB} + \text{THNRELCONGSUB} + \text{THNRELCONG}) / \text{TASSALL}$

Table 6- Further Definitions		
S/N	KPIs	Meaning
1	CSSR	Call Set-up Success Rate
2	BCR	Block Call Rate
3	CDR	Call Drop Rate
4	CST	Call Set-up Time
5	SQI	Speech Quality Index
6	MOS	Mean Opinion Score
7	HoSR	Handover Success Rate
8	RxQual	Receive signal quality
9	RxLev	Receive signal level
10	RSCP	Received Signal Code Power
11	EcIo	Chip Energy per Interference
12	IRAT HO	Inter Radio Access Technology Hard Handover
13	RSRP	The average power received from a single Reference signal
14	RSRQ	Quality of the received signal
15	SiNR	Signal to Noise Ratio
16	CSFB	Circuit Switch Fall Back
17	RRC	Radio Resource Call Setup Success Rate
18	PS	Packet Switch
19	CS	Circuit Switch
20	QOS	Quality of Service
21	QOE	Quality of Experience
22	BH	Busy Hour
23	SDCCH	Stand Alone Dedicated Control Channel
24	TCH	Traffic Channel
25	RAB	Radio Access Bearer
26	HSDPA	High-Speed Down-link Packet Access
27	HSUPA	High-Speed Up Link Packet Access
28	RAT	Radio Access Technology
29	CSFB	Circuit Switch Fall Back
30	ERAB	Extended Radio Access Bearer
31	E-UTRAN	Evolved- UMTS terrestrial Radio Access Network
32	LTE	Long Term Evolution
33	HOSR	Hand Over Success Rate
34	MOS	Mean Opinion Score
35	SRVCC	Single Radio Voice Call Continuity
36	DT(POLQA)	Perceptual Objective Listening Quality Analysis
37	PtP	Point to Point

	Handover Success Rate	$(\text{HOVERSUC}/\text{HOVERCNT}) * 100$	$100 * (\text{SUMOHSUCC} + \text{SUMEOHSUCC}) / (\text{SUMOHOATT} + \text{SUMEOHATT})$
	TCH Availability	$((\text{Available Basic Physical Channels (BPCs) for traffic channels accumulator} / \text{Number of accumulations of available BPCs for traffic channels counter}) / (\text{Average Number of defined TCH})) * 100\%$	$100 * ((\text{TAVAACC}/\text{TAVASCAN}) / \text{TNUCHCNT (avg)})$
	Cell Availability		$1 - (\text{Sum}((\text{TDWNACC}) \text{ ForEach (Cell Name)}) / \text{Sum}((\text{TDWNSCAN}) \text{ ForEach (Cell Name)}))$
	Location Update Success Rate	$(\text{NLOCNRGSUCC} + \text{NLOCOLDSUCC} + \text{NLOCNRG2SUCC} + \text{NLOCNRG2SUCC}) / (\text{NLOCNRGTOT} + \text{NLOCOLDTOT} + \text{NLOCNRG2TOT} + \text{NLOCOLD2TOT}) * 100 [\%]$	
	Paging Success Rate	$(\text{NPAGIRESUC} + \text{NPAG2RESUC}) / (\text{NPAGILATOT} + \text{NPAGIGLTOT}) * 100 [\%]$	
3G	CSSR CS	$(\text{Nr of RRC Connection Successes (CS)} / \text{Nr of RRC Connection Requests (CS)}) * (\text{Nr of RAB Establishment Successes (CS)} / \text{Nr of RAB Establishment Attempts (CS)}) * 100\%$	$100 * (\text{pmTotNoRrcConnectReqCsSucc} / \text{pmTotNoRrcConnectReqCs}) * (\text{pmNoRabEstablishSuccessSpeech} / (\text{pmNoRabEstablishAttemptSpeech} - \text{pmNoDirRetryAtt}))$
	CSSR PS	$(\text{Nr of RRC Connection Successes (PS)} / \text{Nr of RRC Connection Requests (PS)}) * (\text{Nr of RAB Establishment Successes (PS)} / \text{Nr of RAB Establishment Attempts (PS)}) * 100\%$	$((\text{pmTotNoRrcConnectReqPsSucc}) * (\text{pmNoRabEstSucPacketInteractive} - \text{pmNoRabEstSuccPktInteractiveHs})) / ((\text{pmTotNoRrcConnectReqPs} - \text{pmNoLoadSharingRrcConn}) * (\text{pmNoRabEstAttemptPktInteractive} - \text{pmNoRabEstAtptPktInteractiveHs} + \text{pmNoOfN} + \text{pmNoReqDeniedHs} + \text{pmNoRabEstBlockTnPsI ntHsBest})) * 100$

	DCR CS	$(\sum(\text{Number of Speech RAB Abnormal Releases}) / \sum(\text{Total Number of Speech RAB Releases})) * 100\%$	$(\text{pmNoSystemRabReleaseSpeech} + \text{pmNoSystemRabReleaseCs64}) / ((\text{pmNoNormalRabReleaseSpeech} + \text{pmNoSystemRabReleaseSpeech} + \text{pmNoSystemRabReleaseCs64} + \text{pmNoNormalRabReleaseCs64})) * 100$
	DCR PS	$(\sum(\text{Number of PS RAB Abnormal Releases}) / \sum(\text{Total Number of PS RAB Releases})) * 100\%$	$100 * ((\text{pmNoSystemRabReleasePacket}) / (\text{pmNoRabEstSuccPktInteractiveHs} + \text{pmUpSwitchFachHsSuccess} + (\text{pmNoNormalRabReleasePacket} - \text{pmNoNormalRbReleaseHs}) + (\text{pmNoSystemRabReleasePacket} - \text{pmNoSystemRbReleaseHs})))$
	RAB SSR	$(\text{Nr of RAB Establishment Successes (CS)} / \text{Nr of RAB Establishment Attempts (CS)}) * 100\%$	$100 * (\text{pmNoRabEstablishSuccessSpeech} + \text{pmNoRabEstablishSuccessCs64}) / (\text{pmNoRabEstablishAttemptSpeech} + \text{pmNoRabEstablishAttemptCs64} - \text{pmNoDirRetryAtt})$
	RRC Congestion	This KPI is used to check the RRC Congestion Ratio in a cluster.	NA
	CS RAB Congestion	This KPI is used to check the CS RAB Congestion Ratio in a cluster.	NA
	Soft Handover Success Rate	$\text{SHO Success Rate (\%)} = 100 * (\text{SHO Success Rate Num} / \text{SHO Success Rate Denum})$	$\text{SHO Success Rate (\%)} = 100 * (\text{pmNoTimesRlAddToActSet} / (\text{pmNoTimesRlAddToActSet} + \text{pmNoTimesCellFailAddToActSet}))$
	Cell Availability	$100 * [\text{Measurement time duration in seconds} - (\text{pmCellDowntimeAuto})] / [\text{Measurement time duration in seconds}]$	$(\text{Cell available Time}) / \text{measurement Time Duration} * 100\%$
4G	RRC Connection Setup Success Rate	$100 * (\text{Number of RRC Connection Successes}) / (\text{Number of RRC Connection Attempts})$	$100 * (\text{pmRrcConnEstabSucc} / (\text{pmRrcConnEstabAtt} - \text{pmRrcConnEstabAttReatt}))$
	E-RAB Setup Success Rate	$100 * (\text{Nr of E-RAB Setup Successes}) / (\text{Nr of E-RAB Setup Attempts})$	$100 * (\text{pmS1SigConnEstabSucc} / \text{pmRrcConnEstabSucc}) * (\text{pmErabEstabSuccInit} / \text{pmErabEstabAttInit})$
	Accessibility (SSSR %)	$100 * (\text{Nr of E-RAB Setup Successes}) / (\text{Nr of E-RAB Setup Attempts})$	$100 * (\text{pmRrcConnEstabSucc} / (\text{pmRrcConnEstabAtt} - \text{pmRrcConnEstabAttReatt})) * (\text{pmS1SigConnEstabSucc} / \text{pmRrcConnEstabSucc}) * (\text{pmErabEstabSuccInit} / \text{pmErabEstabAttInit})$

Intra-Frequency Handover Out Success Rate	$100 * (\text{Number of Outgoing Intra-Frequency Handover Execution Successes}) / (\text{Number of Outgoing Intra-Frequency Handover Preparation Attempts})$	$(\text{pmHoPrepSuccLteIntraF} / \text{pmHoPrepAttLteIntraF} * \text{pmHoExeSuccLteIntraF} / \text{pmHoExeAttLteIntraF}) * 100$
Inter-Frequency Handover Out Success Rate	$100 * (\text{Number of Outgoing Inter-Frequency Handover Execution Successes}) / (\text{Number of Outgoing Inter-Frequency Handover Preparation Attempts})$	$((\text{pmHoPrepSuccLteIntraF} + \text{pmHoPrepSuccLteInterF}) / (\text{pmHoPrepAttLteIntraF} + \text{pmHoPreAttLteInterF})) * ((\text{pmHoExeSuccLteIntraF} + \text{pmHoExeSuccLteInterF}) / (\text{pmHoPrepExeAttLteIntraF} + \text{pmHoExeAttLteInterF})) * 100$
CSFB Preparation Success Rate (%)	$100 * (\text{Nr of RRC Release with Redirects for CSFB (L2G)} + \text{Nr of RRC Release with Redirects for CSFB (L2U)}) / (\text{Nr of CSFB Indicators Received})$	$100 * (\text{UtranCellRelation.pmHoPrepSuccCsf} / \text{UtranCellRelation.pmHoPrepAttCsf}) * (\text{UtranCellRelation.pmHoExeSuccCsf} / \text{UtranCellRelation.pmHoExeAttCsf})$
Service Call drop rate	$100 * (\text{Number of Abnormal eNB E-RAB Releases} + \text{Number of Abnormal MME E-RAB Releases}) / (\text{Number of E-RAB Releases})$	$100 * (\text{pmErabRelAbnormalEnbAct} + \text{pmErabRelAbnormalMmeAct}) / (\text{pmErabRelAbnormalEnb} + \text{pmErabRelMme} + \text{pmErabRelNormalEnb})$
E-Utran UE DL Throughput (kbps)	$1000 * (\text{PDCP DRB Volume DL (kbits)}) / (\text{Cell Throughput Time DL (ms)})$	$(\text{pmPdcPVolDlDrb} - \text{pmPdcPVolDlDrbLastTTI}) / (\text{pmUeThpTimeDl} / 1000)$
E-Utran UE UL Throughput (kbps)	$1000 * (\text{PDCP DRB Volume UL (kbits)}) / (\text{Cell Throughput Time UL (ms)})$	$([\text{pmPdcPVolUlDrb}] + [\text{pmZtemporary4}] + [\text{pmUeThpVolUl}]) / ([\text{pmUeThpTimeUl}] / 1000)$
Cell Availability	$100 * (\text{4G CELL ROP Time} - \text{Cell Downtime System (s)} - \text{Cell Downtime Manual (s)}) / (\text{4G CELL ROP Time})$	$100 * (([\text{period_duration}] * 60) - ([\text{pmCellDowntimeAuto}] + [\text{pmCellDowntimeMan}])) / ([\text{period_duration}] * 60)$

APPENDIX 3
HUAWEI KPI counters

Technology	KPI	Formula	KPI Counter
2G	CSSR	$(\{1\} - [\text{K3001:Failed SDCCH Seizures due to Busy SDCCH}] / [\text{K3000:SDCCH Seizure Requests}] * (\{1\} - [\text{CM30:Call Drops on SDCCH}] / [\text{K3003:Successful SDCCH Seizures}]) * [\text{K3013A:Successful TCH Seizures (Traffic Channel)}] / [\text{K3010A:TCH Seizure Requests (Traffic Channel)}]) * \{100\}$	$(1 - 1278087420) / (1278087419 * (1 - (1278072520 / 1278087421))) * (1278087432 / 1278087430) * 100$
	SDCCH Cong	$[\text{K3001:Failed SDCCH Seizures due to Busy SDCCH}] / [\text{K3000:SDCCH Seizure Requests}] * 100$	$(1278087420 / 1278087419) * 100$
	Drop Call Rate	$[\text{CM33:Call Drops on Traffic Channel}] / ([\text{K3013A:Successful TCH Seizures (Traffic Channel)}] + [\text{K3013B:Successful TCH Seizures in TCH handovers (Traffic Channel)}] + [\text{K3023:Successful TCH Seizures (Signaling Channel)}]) * \{100\}$	$(1278072498 / (1278087432 + 1278087436 + 1278087427)) * 100$
	TCH Congestion	$[\text{K3011A:Failed TCH Seizures due to Busy TCH (Traffic Channel)}] / [\text{K3010A:TCH Seizure Requests (Traffic Channel)}] * \{100\}$	$(1278087431 / 1278087430) * 100$
	Handover Success Rate	$(\text{CH313} + \text{CH333}) / (\text{CH311} + \text{CH331}) * 100$	$(1278079528 + 1278081557) / (1278079531 + 1278081558) * 100$
	TCH Availability	$[\text{K3015:Available TCHs}] / [\text{K3016:Configured TCHs}] * \{100\}$	$(1278087439 / 1278087440) * 100$
	Cell Availability	$[\text{CR373:Cell In-Service Duration}] / ([\text{CR373:Cell In-Service Duration}] + [\text{R373:Cell Out-of-Service Duration}]) * \{100\}$	$(1276071425 / (1276071425 + 1276071423)) * 100$

3G	CSSR CS	$\frac{([RRC.SuccConnEstab.OrgConvCall]+[RRC.SuccConnEstab.EmgCall]+[RRC.SuccConnEstab.CallReEst]+[RRC.SuccConnEstab.TmConvCall])/([RRC.AttConnEstab.OrgConvCall]+[RRC.AttConnEstab.TmConvCall]+[RRC.AttConnEstab.EmgCall]+[RRC.AttConnEstab.CallReEst])}{([VS.RAB.SuccEstabCS.Conv]+[VS.RAB.SuccEstabCS.Str])/([VS.RAB.AttEstabCS.Conv]+[VS.RAB.AttEstabCS.Str])} * \{100\}$	$\frac{([67179457] + [67179466] + [67179473] + [67179462]) / ([67179329] + [67179334] + [67179338] + [67179345])}{([67179827] + [67179828]) / ([67179825] + [67179826])} * \{100\}$
	CSSR PS	$\frac{([RRC.SuccConnEstab.OrgBkgCall]+[RRC.SuccConnEstab.OrgInterCall]+[RRC.SuccConnEstab.TmBkgCall]+[RRC.SuccConnEstab.TmItrCall])/([RRC.AttConnEstab.TmBkgCall]+[RRC.AttConnEstab.TmInterCall]+[RRC.AttConnEstab.OrgBkgCall]+[RRC.AttConnEstab.OrgInterCall])}{([VS.RAB.SuccEstabPS.Conv]+[VS.RAB.SuccEstabPS.Str]+[VS.RAB.SuccEstabPS.Int]+[VS.RAB.SuccEstabPS.Bkg])/([VS.RAB.AttEstabPS.Conv]+[VS.RAB.AttEstabPS.Str]+[VS.RAB.AttEstabPS.Int]+[VS.RAB.AttEstabPS.Bkg])} * \{100\}$	$\frac{([67179460] + [671794590] + [67179465] + [67179464]) / ([67179337] + [67179336] + [67179332] + [67179331])}{([67179925] + [67179926] + [67179927] + [67179928]) / ([67179921] + [67179922] + [67179923] + [67179924])} * \{100\}$
	DCR CS	$\frac{[VS.RAB.AbnormRel.AMR]}{([VS.RAB.AbnormRel.AMR]+[VS.RAB.NormRel.AMR])} * \{100\}$	$\frac{[67180082]}{([67180082] + [67190518])} * \{100\}$
	DCR PS	$\frac{([VS.RAB.AbnormRel.PS]-[VS.RAB.AbnormRel.PS.PCH]-[VS.RAB.AbnormRel.PS.D2P]-[VS.RAB.AbnormRel.PS.F2P])/([VS.RAB.AbnormRel.PS]+[VS.RAB.NormRel.PS]-[VS.RAB.AbnormRel.PS.PCH]-[VS.RAB.NormRel.PS.PCH]+[VS.DCCC.D2P.Succ]+[VS.DCCC.Succ.F2P]+[VS.DCCC.Succ.D2U]+[VS.DCCC.Succ.F2U])}{[VS.RAB.AbnormRel.PS]-[VS.RAB.AbnormRel.PS.PCH]-[VS.RAB.NormRel.PS.PCH]+[VS.DCCC.D2P.Succ]+[VS.DCCC.Succ.F2P]+[VS.DCCC.Succ.D2U]+[VS.DCCC.Succ.F2U]} * \{100\}$	$\frac{([67179781] - [73421883] - [73422166] - [73421886]) / ([67179782] - [73421883] - [73421882] + [73421766] + [67192584] + [73424899] + [73424897])}{[67179781] - [73421883] - [73422166] - [73421886]} * \{100\}$
	RAB SSR CS	$\frac{([VS.RAB.SuccEstabCS.Conv]+[VS.RAB.SuccEstabCS.Str])/([VS.RAB.AttEstabCS.Conv]+[VS.RAB.AttEstabCS.Str])}{[VS.RAB.SuccEstabCS.Conv]+[VS.RAB.SuccEstabCS.Str]} * \{100\}$	$\frac{([67179827] + [67179828])}{([67179825] + [67179826])} * \{100\}$

	RAB SSR PS	$\frac{([VS.RAB.SuccEstabPS.Conv]+[VS.RAB.SuccEstabPS.Str]+[VS.RAB.SuccEstabPS.Int]+[VS.RAB.SuccEstabPS.Bkg])/([VS.RAB.AttEstabPS.Conv]+[VS.RAB.AttEstabPS.Str]+[VS.RAB.AttEstabPS.Int]+[VS.RAB.AttEstabPS.Bkg])}{100}$	$\frac{([67179925] + [67179926] + [67179927] + [67179928])}{([67179921] + [67179922] + [67179923] + [67179924])} * 100$
	RRC Congestion	$[VS.RRC.Rej.DLPower.Cong]+[VS.RRC.Rej.Code.Cong]+[VS.RRC.Rej.DLCE.Cong]+[VS.RRC.Rej.DLIUBBand.Cong]+[VS.RRC.Rej.ULCE.Cong]+[VS.RRC.Rej.ULPower.Cong]$	$[67193610] + [67179524] + [67190405] + [67192609] + [67190404] + [67193609]$
	CS RAB Congestion	$([VS.RAB.FailEstabCS.DLIUBBand.Cong]+[VS.RAB.FailEstabCS.ULIUBBand.Cong]+[VS.RAB.FailEstabCS.ULCE.Cong]+[VS.RAB.FailEstabCS.DLCE.Cong]+[VS.RAB.FailEstabCS.Code.Cong]+[VS.RAB.FailEstabCS.ULPower.Cong]+[VS.RAB.FailEstabCS.DLPower.Cong])$	$([67192610] + [67192611] + [67190406] + [67190407] + [67179864] + [67193611] + [67193612])$
	Soft Handover Success Rate	$\frac{([VS.SHO.SuccRLAdd]+[VS.SHO.SuccRLDel])/([VS.SHO.AttRLAdd]+[VS.SHO.AttRLDel])}{100}$	$\frac{([67180499] + [67180509])}{([67180498] + [67180508])} * 100$
	Cell Availability	$100 - \frac{[VS.Cell.UnavailTime.Sys]}{60} / GP * 100$	$100 - \frac{[67204837]}{60} / GP * 100$
4G	RRC Connection Setup Success Rate	$\frac{[L.RRC.ConnReq.Succ]}{[L.RRC.ConnReq.Att]} * 100$	$\frac{[1526726659]}{[1526726658]} * 100$
	E-RAB Setup Success Rate	$ERAB.NbrSuccEstab/ERAB.NbrAttEstab*100\%$	$\frac{L.E-RAB.SuccEst[1526727544]}{L.E-RAB.AttEst[1526727545]}$
	Accessibility (SSSR %)	$RRC\ Connection\ Setup\ Success\ Rate * E-RAB\ Setup\ Success\ Rate * 100\%$	$\frac{L.RRC.ConnReq.Succ[1526726659]}{L.RRC.ConnReq.Att[1526726658]} * \frac{L.E-RAB.SuccEst[1526727544]}{L.E-RAB.AttEst[1526727545]}$

Intra-Frequency Handover Out Success Rate	$\text{HO.SuccOutIntraFreq}/\text{HO.At tOutExecIntraFreq} * 100\%$	$(\text{L.HHO.InterNB.IntraFreq.ExecSuccOut}[1526727003] + \text{L.HHO.IntraNB.IntraFreq.ExecSuccOut}[1526726997]) - \text{L.HHO.InterNB.IntraFreq.Succ.ReEst2Src}[1526728904] - \text{L.HHO.IntraNB.IntraFreq.Succ.ReEst2Src}[1526728902]) / (\text{L.HHO.InterNB.IntraFreq.PrepareAttOut}[1526727001] + \text{L.HHO.IntraNB.IntraFreq.ExecAttOut}[1526726996])$
Inter-Frequency Handover Out Success Rate	$\text{HO.SuccOutInterFreq}/\text{HO.At tOutExecInterFreq} * 100\%$	$(\text{L.HHO.InterNB.InterFreq.ExecSuccOut}[1526727006] + \text{L.HHO.IntraNB.InterFreq.ExecSuccOut}[1526727000]) - \text{L.HHO.InterNB.InterFreq.Succ.ReEst2Src}[1526728905] - \text{L.HHO.IntraNB.InterFreq.Succ.ReEst2Src}[1526728903]) / (\text{L.HHO.IntraNB.InterFreq.ExecAttOut}[1526726999] + \text{L.HHO.InterNB.InterFreq.PrepareAttOut}[1526727004])$
CSFB Preparation Success Rate (%)	$100 * (\text{L.RRCRedirection.E2G.CSFB} + \text{L.RRCRedirection.E2W.CSFB}) / \text{L.CSFB.PrepareAtt}$	$100 * (\text{L.RRCRedirection.E2G.CSFB} + \text{L.RRCRedirection.E2W.CSFB}) / \text{L.CSFB.PrepareAtt}$
Service Call drop rate	$(\text{CONTEXT.AttRelEnb-Normal} - \text{CONTEXT.AttRelEnb.Normal}) / (\text{CONTEXT.SuccInitialSetup} + \text{CONTEXT.NbrLeft}) * 100\%$	$(\text{L.UECNTX.Rel.S1Reset.eNodeB}[1526728838] - \text{L.UECNTX.Rel.eNodeB.InitAttEst.MMENoReply}[1526737847] + \text{L.UECNTX.AbnormRel}[1526728227]) / (\text{L.UECNTX.SuccEst}[1526728851] + \text{L.UECNTX.Left}[1526730538])$
E-Utran UE DL Throughput (kbps)	$\text{PDCP.UpOctDL} * 8 / \text{PDCP.ThrpTimeDL}$	$\text{L.Thrp.bits.DL}[1526728261] / 1000000 / \text{L.Thrp.Time.DL}[1526728262]$
E-Utran UE UL Throughput (kbps)	$\text{PDCP.UpOctUL} * 8 / \text{PDCP.ThrpTimeUL}$	$\text{L.Thrp.bits.UL}[1526728259] / 1000000 / \text{L.Thrp.Time.UL}[1526728260]$

	Availability	$\frac{([L.Cell.Avail.Dur])}{([L.Cell.Avail.Dur]+[L.Cell.Unavail.Dur.Sys]+[L.Cell.Unavail.Dur.Manual]+[L.Cell.Unavail.Dur.EnergySaving])} * \{100\}$	$\frac{([1526728320])}{([1526728320]+[1526727209]+[1526727210]+[1526728493])} * \{100\}$
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APPENDIX 4
ZTE KPI counters

Technology	KPI	Formula	Counter
2G	CSSR	$\frac{((1-[Number\ of\ SDCCH\ drops])/([Number\ of\ SDCCH\ assignment\ success]+[Number\ of\ BSC-controlled\ inter-cell\ incoming\ handover\ success\ (on\ SDCCH)]+[Number\ of\ MSC-controlled\ incoming\ handover\ success\ (on\ SDCCH)])) * ([Number\ of\ voice\ TCH/F\ assignment\ success]+[Number\ of\ voice\ TCH/H\ assignment\ success])}{([Number\ of\ voice\ TCH/F\ seizure\ attempts\ for\ assignment]+[Number\ of\ voice\ TCH/H\ seizure\ attempts\ for\ assignment])} * (1 - \frac{([Number\ of\ SDCCH\ seizure\ failure\ for\ assignment]+[Number\ of\ SDCCH\ seizure\ failure\ for\ handover])}{([Number\ of\ SDCCH\ seizure\ attempts\ for\ assignment]+[Number\ of\ SDCCH\ seizure\ attempts\ for\ handover])})$	$((1 - C901070050 / (C901250014 + C902120018 + C902120033)) * ((C901260063 + C901270063) / (C901260020 + C901270020)) * (1 - (C901250003 + C901250006) / (C901250001 + C901250004)))$

	SDCC H Cong	$\frac{((1 - [\text{Number of SDCCH drops}] / ([\text{Number of SDCCH assignment success}] + [\text{Number of BSC-controlled inter-cell incoming handover success (on SDCCH)}] + [\text{Number of MSC-controlled incoming handover success (on SDCCH)}])) * ([\text{Number of voice TCH/F assignment success}] + [\text{Number of voice TCH/H assignment success}]) / ([\text{Number of voice TCH/F seizure attempts for assignment}] + [\text{Number of voice TCH/H seizure attempts for assignment}])) * (1 - ([\text{Number of SDCCH seizure failure for assignment}] + [\text{Number of SDCCH seizure failure for handover}]) / ([\text{Number of SDCCH seizure attempts for assignment}] + [\text{Number of SDCCH seizure attempts for handover}])))}{(C901250003 + C901250006) / (C901250001 + C901250004)}$	
	Drop Call Rate	$\frac{([\text{Number of TCH/F drops}] + [\text{Number of TCH/H drops}] / ([\text{Number of voice TCH/F assignment success}] + [\text{Number of voice TCH/H assignment success}]))}{((C901070051 + C901070052) / (C901260063 + C901270063))}$	
	TCH Congest ion	$\frac{([\text{Number of voice TCH/F seizure failure for assignment}] + [\text{Number of voice TCH/H seizure failure for assignment}]) / ([\text{Number of voice TCH/F}])}{(C901260022 + C901270022) / (C901260020 + C901270020)}$	

		seizure attempts for assignment)+[Number of voice TCH/H seizure attempts for assignment])	
Handover Success Rate		(([Number of BSC-controlled inter-cell outgoing handover success]+[Number of MSC-controlled outgoing handover success])/([Number of BSC-controlled inter-cell outgoing handover]+[Number of MSC-controlled outgoing handover]))	((C901090003+C901090010)/(C901090002+C901090009))
TCH Availability		(([Average number of available dynamic radio channel]+[Number of available static TCH/Fs]+[Number of available static TCH/Hs])/([Average number of available dynamic radio channel]+[Number of available static TCH/Fs]+[Number of available static TCH/Hs]+[Average number of unavailable dynamic radio channel]+[Number of unavailable defined TCH/Hs]+[Number of unavailable defined TCH/Fs]))*100	(C901080009+C901080028+C901080019)/(C901080009+C901080028+C901080019+C901080010+C901080020+C901080029)
Cell Availability		1-([Cell down time due to link break(s)]+[Cell down time due to site fault(s)]+[Cell down time due to manual block(s)])/Gr	1-(C901080083+C901080084+C901080034)/Gr

3G	CSSR CS	<p>(([Number of successful RRC connection access for originating conversational calls]+[Number of successful RRC connection access for terminating conversational calls]+[Number of successful RRC connection access for emergency calls])/([Number of RRC connection attempts due to originating conversational calls]+[Number of RRC connection attempts due to terminating conversational calls]+[Number of RRC connection attempts due to emergency calls]-[Number of repeated RRC connection attempts due to originating conversational calls]-[Number of repeated RRC connection attempts due to terminating conversational calls]-[Number of repeated RRC connection attempts due to emergency calls]))*([Number of successful RAB establishment in the CS domain for conversational services]+[Number of successful RAB establishment in the CS domain for streaming services]+[Number of successful RAB</p>	<p>((C310080170+C310080177+C310080185)/(C310080001+C310080008+C31008016-C310080023-C310080030-C310080038))*((C310100711+C310100733+C310100734+C310100735)/(C310090252+C310090274+C310090275+C310090276))</p>
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		<p>establishment in the CS domain for interactive services]+[Number of successful RAB establishment in the CS domain for background services])/([Number of RAB establishment attempts in the CS domain for conversational services]+[Number of RAB establishment attempts in the CS domain for streaming services]+[Number of RAB establishment attempts in the CS domain for interactive services]+[Number of RAB establishment attempts in the CS domain for background services]))</p>	
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	CSSR PS	<p>(([Number of successful RRC connection access for originating streaming calls]+[Number of successful RRC connection access for originating interactive calls]+[Number of successful RRC connection access for originating background calls]+[Number of successful RRC connection access due to originating high-priority signaling]+[Number of successful RRC connection access due to originating low-priority signaling]+[Number of successful RRC connection access for terminating streaming calls]+[Number of successful RRC connection access for terminating interactive calls]+[Number of successful RRC connection access for terminating background calls]+[Number of successful RRC connection access due to terminating high-priority signaling]+[Number of successful RRC connection access due to terminating low-priority signaling])/([Number of RRC connection attempts due to originating streaming calls]+[Number of RRC connection attempts due to originating interactive</p>	<p>((C310080171+C310080172+C310080173+C310080175+C310080176+C310080178+C310080179+C310080180+C310080181+C310080182)/((C310080002+C310080003+C310080004+C310080006+C310080007+C310080009+C310080010+C310080011+C310080012+C310080013)-(C310080024+C310080025+C310080026+C310080028+C310080029+C310080031+C310080032+C310080033+C310080034+C310080035)))*((C310100736+C310100739+C310100752+C310100768)/(C310090277+C310090280+C310090293+C310090309))</p>
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		<p>calls]+[Number of RRC connection attempts due to originating background calls]+[Number of RRC connection attempts due to originating high-priority signaling]+[Number of RRC connection attempts due to originating low-priority signaling]+[Number of RRC connection attempts due to terminating streaming calls]+[Number of RRC connection attempts due to terminating interactive calls]+[Number of RRC connection attempts due to terminating background calls]+[Number of RRC connection attempts due to terminating high-priority signaling]+[Number of RRC connection attempts due to terminating low-priority signaling])-([Number of repeated RRC connection attempts due to originating streaming calls]+[Number of repeated RRC connection attempts due to originating interactive calls]+[Number of repeated RRC connection attempts due to originating background calls]+[Number of repeated RRC</p>	
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		<p>connection attempts due to originating high-priority signaling]+[Number of repeated RRC connection attempts due to originating low-priority signaling]+[Number of repeated RRC connection attempts due to terminating streaming calls]+[Number of repeated RRC connection attempts due to terminating interactive calls]+[Number of repeated RRC connection attempts due to terminating background calls]+[Number of repeated RRC connection attempts due to terminating high-priority signaling]+[Number of repeated RRC connection attempts due to terminating low-priority signaling]])*([Number of successful RAB establishment in the PS domain for conversational services]+[Number of successful RAB establishment in the PS domain for streaming services]+[Number of successful RAB establishment in the PS domain for interactive services]+[Number of successful RAB establishment in the PS domain for background services])/([Number</p>	
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		of RAB establishment attempts in the PS domain for conversational services)+[Number of RAB establishment attempts in the PS domain for streaming services)+[Number of RAB establishment attempts in the PS domain for interactive services)+[Number of RAB establishment attempts in the PS domain for background services]))	
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	DCR CS	<p>([Number of abnormally released RABs of CS-domain conversational services (AMR12.2K)]+[Number of abnormally released RABs of CS-domain conversational services (AMR10.2K)]+[Number of abnormally released RABs of CS-domain conversational services (AMR7.95K)]+[Number of abnormally released RABs of CS-domain conversational services (AMR7.4K)]+[Number of abnormally released RABs of CS-domain conversational services (AMR6.7K)]+[Number of abnormally released RABs of CS-domain conversational services (AMR5.9K)]+[Number of abnormally released RABs of CS-domain conversational services (AMR5.15K)]+[Number of abnormally released RABs of CS-domain conversational services (AMR4.75K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR23.85K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR23.05K)]+[Number of abnormally released RABs of CS-domain conversational</p>	<p>(C310231162+C310231163+C310231164+C310231165+C310231166+C310231167+C310231168+C310231169+C310231170+C310231171+C310231172+C310231173+C310231174+C310231175+C310231176+C310231177+C310231178+C310231179+C310231180+C310231181+C310231182+C310231183+C310231184)/(C310231185+C310231186+C310231187+C310231188+C310231189+C310231190+C310231191+C310231192+C310231193+C310231194+C310231195+C310231196+C310231197+C310231198+C310231199+C310231200+C310231201+C310231202+C310231203+C310231204+C310231205+C310231206+C310231207)</p>
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		<p>services (WB-AMR19.85K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR18.25K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR15.85K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR14.25K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR12.65K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR8.85K)]+[Number of abnormally released RABs of CS-domain conversational services (WB-AMR6.60K)]+[Number of abnormally released RABs of CS-domain conversational services (32K/32K)]+[Number of abnormally released RABs of CS-domain conversational services (64K/64K, Videotelephone)]+[Number of abnormally released RABs of CS-domain conversational other services]+[Number of abnormally released RABs of CS-domain streaming services]+[Number of abnormally released RABs of CS-domain interactive</p>	
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		<p>services)+[Number of abnormally released RABs of CS-domain background services]/([Total number of released RABs of CS-domain conversational services (AMR12.2K)]+[Total number of released RABs of CS-domain conversational services (AMR10.2K)]+[Total number of released RABs of CS-domain conversational services (AMR7.95K)]+[Total number of released RABs of CS-domain conversational services (AMR7.4K)]+[Total number of released RABs of CS-domain conversational services (AMR6.7K)]+[Total number of released RABs of CS-domain conversational services (AMR5.9K)]+[Total number of released RABs of CS-domain conversational services (AMR5.15K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR4.75K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR23.85K)]+[Total number of released RABs of CS-domain conversational services (WB-</p>	
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		<p>AMR23.05K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR19.85K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR18.25K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR15.85K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR14.25K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR12.65K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR8.85K)]+[Total number of released RABs of CS-domain conversational services (32K/32K)]+[Total number of released RABs of CS-domain conversational services (64K/64K, Videotelephone)]+[Total number of released RABs of CS-domain conversational other services]+[Total number of released RABs of CS-domain streaming services]+[Total</p>	
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		number of released RABs of CS-domain interactive services]+[Total number of released RABs of CS-domain background services])	
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	DCR PS	([Number of abnormally released RABs of PS-domain conversational VOIP services]+[Number of abnormally released RABs of PS-domain conversational other services]+[Number of abnormally released RABs of PS-domain streaming services (8K/8K)]+[Number of abnormally released RABs of PS-domain streaming services (32K/32K)]+[Number of abnormally released RABs of PS-domain streaming services (16K/64K)]+[Number of abnormally released RABs of PS-domain streaming services (64K/64K)]+[Number of abnormally released RABs of PS-domain streaming services (64K/128K)]+[Number of abnormally released RABs of PS-domain streaming services (64K/144K)]+[Number of abnormally released RABs of PS-domain streaming services (64K/256K)]+[Number of abnormally released RABs of PS-domain streaming services (64K/384K)]+[Number of abnormally released RABs of PS-	(C310241254+C310241255+C310241256+C310241257+C310241258+C310241259+C310241260+C310241261+C310241262+C310241263+C310241264+C310241265+C310241266+C310241267+C310241268+C310241269+C310241270+C310241271+C310241272+C310241273+C310241274+C310241275+C310241276+C310241277+C310241278+C310241279+C310241280+C310241281+C310241282+C310241283+C310241284+C310241285+C310241286+C310241287+C310241288+C310241289+C310241290+C310241291+C310241292-C310282103-C310282104-C310282105-C310282106-C310282107-C310282108-C310282109-C310282110-C310282111-C310282112-C310282113-C310282114-C310282119)/(C311866866+C311866868+C311866869+C311866870+C311866871+C311866872+C311866873+C311866874+C311866875+C311866876+C311866878+C311866879+C311866880+C311866881+C311866882+C311866883+C311866884+C311866885+C311866886+C311866887+C311866888+C311866890+C311866891+C311866892+C311866893+C311866894+C311866895+C311866896+C311866897+C311866898+C311866899+C311866900)
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		<p>domain streaming services (above 384K/384K)]+[Number of abnormally released RABs of PS-domain streaming other services]+[Number of abnormally released RABs of PS-domain interactive services (8K/8K)]+[Number of abnormally released RABs of PS-domain interactive services (32K/32K)]+[Number of abnormally released RABs of PS-domain interactive services (16K/64K)]+[Number of abnormally released RABs of PS-domain interactive services (64K/64K)]+[Number of abnormally released RABs of PS-domain interactive services (64K/128K)]+[Number of abnormally released RABs of PS-domain interactive services (64K/144K)]+[Number of abnormally released RABs of PS-domain interactive services (64K/256K)]+[Number of abnormally released RABs of PS-domain interactive services (64K/384K)]+[Number of abnormally released RABs of PS-domain interactive services (128K/128K)]+[Number of abnormally released RABs of PS-domain interactive</p>	
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		<p>services (128K/144K)]+[Number of abnormally released RABs of PS-domain interactive services (128K/384K)]+[Number of abnormally released RABs of PS-domain interactive services (384K/384K)]+[Number of abnormally released RABs of PS-domain interactive other services]+[Number of abnormally released RABs of PS-domain background services (8K/8K)]+[Number of abnormally released RABs of PS-domain background services (32K/32K)]+[Number of abnormally released RABs of PS-domain background services (16K/64K)]+[Number of abnormally released RABs of PS-domain background services (64K/64K)]+[Number of abnormally released RABs of PS-domain background services (64K/128K)]+[Number of abnormally released RABs of PS-domain background services (64K/144K)]+[Number of abnormally released RABs of PS-domain background services (64K/256K)]+[Number of abnormally released RABs of PS-domain background services</p>	
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		<p>(64K/384K)]+[Number of abnormally released RABs of PS-domain background services</p> <p>(128K/128K)]+[Number of abnormally released RABs of PS-domain background services</p> <p>(128K/144K)]+[Number of abnormally released RABs of PS-domain background services</p> <p>(128K/384K)]+[Number of abnormally released RABs of PS-domain background services</p> <p>(384K/384K)]+[Number of abnormally released RABs of PS-domain background other services]-</p> <p>[Number of RABs of PS-domain services requested to be released by the RNC due to RB setup expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to RB release expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to soft handover expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to softer handover expiration]-</p> <p>[Number of RABs of PS-domain services requested to be released by the RNC due to UE not</p>	
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		<p>involved relocation UMI expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to hard handover expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to DRBC expiration (channel switchover)]-[Number of RABs of PS-domain services requested to be released by the RNC due to DRBC expiration (rate adjustment)]-[Number of RABs of PS-domain services requested to be released by the RNC due to serving cell change expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to Uu reconfiguration failure]-[Number of RABs of PS-domain services requested to be released by the RNC due to security mode expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to signaling reconfiguration failure]-[Number of RABs of PS-domain services requested to be released by the RNC due to relocation expiration)]/([Number of released RBs for PS-domain</p>	
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		<p>conversational services]+[Number of released RBs for PS-domain streaming services (8K/8K)]+[Number of released RBs for PS-domain streaming services (32K/32K)]+[Number of released RBs for PS-domain streaming services (16K/64K)]+[Number of released RBs for PS-domain streaming services (64K/64K)]+[Number of released RBs for PS-domain streaming services (64K/128K)]+[Number of released RBs for PS-domain streaming services (64K/256K)]+[Number of released RBs for PS-domain streaming services (64K/384K)]+[Number of released RBs for PS-domain streaming services (384K/384K)]+[Number of released RBs for PS-domain streaming other services]+[Number of released RBs for PS-domain interactive services (8K/8K)]+[Number of released RBs for PS-domain interactive services (32K/32K)]+[Number of released RBs for PS-domain interactive services (16K/64K)]+[Number of released RBs for PS-domain interactive services (64K/64K)]+[Number</p>	
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		<p>r of released RBs for PS-domain interactive services $(64K/128K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(64K/256K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(64K/384K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(128K/128K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(128K/384K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(384K/384K)] + [\text{Number of released RBs for PS-domain interactive other services}] + [\text{Total number of RB release for PS domain, background-8K/8K}] + [\text{Total number of RB release for PS domain, background-32K/32K}] + [\text{Total number of RB release for PS domain, background-16K/64K}] + [\text{Total number of RB release for PS domain, background-64K/64K}] + [\text{Total number of RB release for PS domain, background-64K/128K}] + [\text{Total number of RB release for PS domain, background-64K/256K}] + [\text{Total number of RB release for PS}$</p>	
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		<p>domain,background-64K/384K]+[Total number of RB release for PS</p> <p>domain,background-128K/128K]+[Total number of RB release for PS</p> <p>domain,background-128K/384K]+[Total number of RB release for PS</p> <p>domain,background-384K/384K]+[Total number of RB release for PS</p> <p>domain,background-other])</p>	
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	RAB SSR	<p>([Number of successful RAB establishment in the CS domain for conversational services]+[Number of successful RAB establishment in the CS domain for streaming services]+[Number of successful RAB establishment in the CS domain for interactive services]+[Number of successful RAB establishment in the CS domain for background services]+[Number of successful RAB establishment in the PS domain for conversational services]+[Number of successful RAB establishment in the PS domain for streaming services]+[Number of successful RAB establishment in the PS domain for interactive services]+[Number of successful RAB establishment in the PS domain for background services])/([Number of RAB establishment attempts in the CS domain for conversational services]+[Number of RAB establishment attempts in the CS domain for streaming services]+[Number of RAB establishment attempts in the CS domain for interactive services]+[Number of</p>	<p>(C310100711+C310100733+C310100734+C310100735+C310100736+C310100739+C310100752+C310100768)/(C310090252+C310090274+C310090275+C310090276+C310090277+C310090280+C310090293+C310090309)</p>
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		RAB establishment attempts in the CS domain for background services]+[Number of RAB establishment attempts in the PS domain for conversational services]+[Number of RAB establishment attempts in the PS domain for streaming services]+[Number of RAB establishment attempts in the PS domain for interactive services]+[Number of RAB establishment attempts in the PS domain for background services])	
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	RRC Congestion	<p>[Number of RRC connection rejections due to congestion]/([Number of RRC connection attempts due to originating conversational calls]+[Number of RRC connection attempts due to originating streaming calls]+[Number of RRC connection attempts due to originating interactive calls]+[Number of RRC connection attempts due to originating background calls]+[Number of RRC connection attempts due to originating customized calls]+[Number of RRC connection attempts due to originating high-priority signaling]+[Number of RRC connection attempts due to originating low-priority signaling]+[Number of RRC connection attempts due to terminating conversational calls]+[Number of RRC connection attempts due to terminating streaming calls]+[Number of RRC connection attempts due to terminating interactive calls]+[Number of RRC connection attempts due to terminating background calls]+[Number of</p>	<p>C310555130/((C310080001+C310080002+C310080003+C310080004+C310080005+C310080006+C310080007+C310080008+C310080009+C310080010+C310080011+C310080012+C310080013+C310080014+C310080015+C310080016+C310080017+C310080018+C310080019+C310080020+C310080021+C310080022)-(C310080023+C310080024+C310080025+C310080026+C310080027+C310080028+C310080029+C310080030+C310080031+C310080032+C310080033+C310080034+C310080035+C310080036+C310080037+C310080038+C310080039+C310080040+C310080041+C310080042+C310080043+C310080044))</p>
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		<p>RRC connection attempts due to terminating high-priority signaling]+[Number of RRC connection attempts due to terminating low-priority signaling]+[Number of RRC connection attempts due to terminating calls with unknown causes]+[Number of RRC connection attempts due to registration]+[Number of RRC connection attempts due to emergency calls]+[Number of RRC connection attempts due to inter-RAT cell reselection]+[Number of RRC connection attempts due to inter-RAT cell change order]+[Number of RRC connection attempts due to detachment]+[Number of RRC connection attempts due to call re-establishment]+[Number of RRC connection attempts due to MBMS reception]+[Number of RRC connection attempts due to MBMS PTP RB requests]-([Number of repeated RRC connection attempts due to originating conversational calls]+[Number of repeated RRC connection attempts due to originating streaming</p>	
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		<p>calls]+[Number of repeated RRC connection attempts due to originating interactive calls]+[Number of repeated RRC connection attempts due to originating background calls]+[Number of repeated RRC connection attempts due to originating customized calls]+[Number of repeated RRC connection attempts due to originating high-priority signaling]+[Number of repeated RRC connection attempts due to originating low-priority signaling]+[Number of repeated RRC connection attempts due to terminating conversational calls]+[Number of repeated RRC connection attempts due to terminating streaming calls]+[Number of repeated RRC connection attempts due to terminating interactive calls]+[Number of repeated RRC connection attempts due to terminating background calls]+[Number of repeated RRC connection attempts due to terminating high-priority signaling]+[Number of repeated RRC connection attempts due to terminating</p>	
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		<p>low-priority signaling]+[Number of repeated RRC connection attempts due to terminating calls with unknown causes]+[Number of repeated RRC connection attempts due to registration]+[Number of repeated RRC connection attempts due to emergency calls]+[Number of repeated RRC connection attempts due to inter-RAT cell reselection]+[Number of repeated RRC connection attempts due to inter-RAT cell change order]+[Number of repeated RRC connection attempts due to detachment]+[Number of repeated RRC connection attempts due to call re-establishment]+[Number of repeated RRC connection attempts due to MBMS reception]+[Number of repeated RRC connection attempts due to MBMS PTP RB requests]))</p>	
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	CS RAB Congestion	<p>([Number of failed RAB assignment setup for the CS domain due to code resource congestion]+[Number of failed RAB assignment setup for the CS domain due to downlink CE congestion]+[Number of failed RAB assignment setup for the CS domain due to uplink CE congestion]+[Number of failed RAB assignment setup for the CS domain due to downlink power resource congestion]+[Number of failed RAB assignment setup for the CS domain due to uplink power resource congestion]+[Number of failed RAB assignment setup for the CS domain due to uplink Iub congestion]+[Number of failed RAB assignment setup for the CS domain due to downlink Iub congestion])/([Number of RAB establishment attempts in the CS domain for conversational services]+[Number of RAB establishment attempts in the CS domain for streaming services]+[Number of RAB establishment attempts in the CS domain for interactive services]+[Number of RAB establishment attempts in the CS domain for background services])</p>	$\frac{(C310110336+C310110337+C310110340+C310110338+C310110341+C310110360+C310110361)}{(C310090252+C310090274+C310090275+C310090276)}$
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	Soft Handover Success Rate	<p>(([Number of attempts of active-set update for cell addition in the case of softer handover]+[Number of attempts of active-set update for cell addition in the case of soft handover]+[Number of attempts of active-set update for cell addition in the case of soft handover over the Uu interface]+[Number of attempts of active-set update for cell deletion in the case of softer handover]+[Number of attempts of active-set update for cell deletion in the case of soft handover]+[Number of attempts of active-set update for cell deletion in the case of soft handover over the Uu interface])-([Number of failed active-set updates for cell addition due to unsupported configuration]+[Number of failed active-set updates for cell addition due to physical channel failures]+[Number of failed active-set updates for cell addition due to incompatible simultaneous reconfiguration]+[Number of failed active-set updates for cell addition due to compression mode errors]+[Number of failed active-set updates for cell</p>	<p>((C310322216+C310322217+C310322218+C310322232+C310322233+C310322234)-(C310322222+C310322223+C310322224+C310322225+C310322226+C310322227+C310322230+C310322231+C310322235+C310322236+C310322237+C310322238+C310322239+C310322240+C310322243+C310322244))/(C310322216+C310322217+C310322218+C310322232+C310322233+C310322234)</p>
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		<p>addition due to protocol errors]+[Number of failed active-set updates for cell addition due to cell update]+[Number of failed active-set updates for cell addition due to no reply]+[Number of failed active-set updates for cell addition due to other causes]+[Number of failed active-set updates for cell deletion due to unsupported configuration]+[Number of failed active-set updates for cell deletion due to physical channel failures]+[Number of failed active-set updates for cell deletion due to incompatible simultaneous reconfiguration]+[Number of failed active-set updates for cell deletion due to compression mode errors]+[Number of failed active-set updates for cell deletion due to protocol errors]+[Number of failed active-set updates for cell deletion due to cell update]+[Number of failed active-set updates for cell deletion due to no reply]+[Number of failed active-set updates for cell deletion due to other causes]])/([Number of attempts of active-set</p>	
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		update for cell addition in the case of softer handover]+[Number of attempts of active-set update for cell addition in the case of soft handover]+[Number of attempts of active-set update for cell addition in the case of soft handover over the Iur interface]+[Number of attempts of active-set update for cell deletion in the case of softer handover]+[Number of attempts of active-set update for cell deletion in the case of soft handover]+[Number of attempts of active-set update for cell deletion in the case of soft handover over the Iur interface])	
	Cell Availability	[Service time of the cell(s)]/(NO*Gr)	C310464560/(NO*Gr)
4G	RRC Connection Setup Success Rate		P311130/(C373200000+C373200004+C373200008+C373200012+C373200016+C373200120+C373200001+C373200002+C373200003+C373200005+C373200006+C373200007+C373200009+C373200010+C373200011+C373200013+C373200014+C373200015+C373200017+C373200018+C373200019+C373200121+C373200122+C373200123+C373200152+C373200153+C373200154+C373200155)
	E-RAB Setup Success Rate		P311149/(C373505473+C373505474+C373505475+C373505476+C373505477+C373505478+C373505479+C373210589+C373505481+C373505482+C373505483+C373505484+C373505485+C373505486+C373505487+C373210599)

	Accessi- bility (SSSR %)		(P311130/(C373200000+C373200004+C373200008+C373200012+C373200016+C373200120+C373200001+C373200002+C373200003+C373200005+C373200006+C373200007+C373200009+C373200010+C373200011+C373200013+C373200014+C373200015+C373200017+C373200018+C373200019+C373200121+C373200122+C373200123+C373200152+C373200153+C373200154+C373200155))* (P311149/(C373505473+C373505474+C373505475+C373505476+C373505477+C373505478+C373505479+C373210589+C373505481+C373505482+C373505483+C373505484+C373505485+C373505486+C373505487+C373210599))
	Intra-Fre- quen- cy Handov- er Out Success Rate		(C373250980+C373261280+C373271580)/(C373250980+C373250981+C373250982+C373250983+C373250989+C373250901+C373250902+C373250903+C373250988+C373261280+C373261281+C373261282+C373261283+C373261201+C373261202+C373261203+C373261204+C373261289+C373261294+C373271580+C373271581+C373271582+C373271583+C373271501+C373271502+C373271503+C373271504+C373271588+C373271593)
	Inter-Fre- quen- cy Handov- er Out Success Rate		P311455/(C373281880+C373281881+C373281882+C373281883+C373281889+C373281801+C373281802+C373281803+C373281888+C373292180+C373292181+C373292182+C373292183+C373292101+C373292102+C373292103+C373292104+C373292189+C373292198+C373302480+C373302481+C373302482+C373302483+C373302401+C373302402+C373302403+C373302404+C373302488+C373302497)
	CSFB Prepara- tion Success		(C373576600+C373576607+C373576614)/(C373220644+C373220647+C373220650+C373220653)

	Rate (%)		
	Service Call drop rate		$((C373200022+C373200023+C373200024+C373200049+C373200051+C373200052+C373200053)/(C373200000+C373200004+C373200008+C373200012+C373200016+C373200031+C373200060+C373200066+C373200072+C373200120+C373250984+C373261284+C373271584+C373281884+C373292184+C373302484+C373312704+C373333304+C373200152))*((C373210381+C373210391+C373210421+C373210441+C373210451+C373210511+C373210521+C373505354)/(C373210461+C373240828+C373505473+C373505481+C373546257))$
	E-Utran UE DL Throughput (kbps)		$(1000*((C374107514*1024)+C374107515)/(C374107516))/1024$
	E-Utran UE UL Throughput (kbps)		$(1000*((C374107517*1024)+C374107518)/(C374107519))/1024$
	Cell Availability		$100*((C373230700+C373230706)/(Gr*NO))$

APPENDIX 5
Nokia Siemens KPI counters

2G	CSSR	$100*(((SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_USER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCCH_BTS_FAIL)+(SDCCH_LAPD_FAIL))/((SDCCH_ASSIGN)+(SDCCH_HO_SEIZ)-(SDCCH_ABIS_FAIL_CALL)-(SDCCH_ABIS_FAIL_OLD)-(SDCCH_A_IF_FAIL_CALL)-(SDCCH_A_IF_FAIL_OLD))))*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON))/(SDCCH_SEIZ_ATT))*((MS_TCH_SUCC_SEIZ_ASSIGN_CMPLT)+(MSC_I_SDCCH_TCH)+(BSC_I_SDCCH_TCH))/((TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC_I_SDCCH_TCH_AT)))$
	SDCCH Cong	$100*(((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON))/(SDCCH_SEIZ_ATT))$

	Drop Call Rate TCH	$100 * (((DROP_AFTER_TCH_ASSIGN) - (TCH_RE_EST_RELEASE)) / ((TCH_NEW_CALL_ASSIGN) + (MSC_I_TCH_TCH) + (BSC_I_TCH_TCH) - (MSC_O_TCH_TCH) - (BSC_O_TCH_TCH) + (MSC_HO_WCDMA_RAN_SUCC)))$
	TCH Congestion	$100 * (((TCH_CALL_REQ - TCH_NORM_SEIZ) - (MSC_O_SDCCH_TCH + HO.BSC_O_SDCCH_TCH + CELL_SDCCH_TCH) + (TCH_SUCC_SEIZ_FOR_DIR_ACC) - (TCH_REJ_DUE_REQ_CH_A_IF_CRC - (BSC_I_UNSUCC_A_INT_CIRC_TYPE + MSC_CONTROLLED_IN_HO + HO_UNSUCC_A_INT_CIRC_TYPE))) / (TCH_CALL_REQ - (TCH_REJ_DUE_REQ_CH_A_IF_CRC - (BSC_I_UNSUCC_A_INT_CIRC_TYPE + MSC_CONTROLLED_IN_HO + HO_UNSUCC_A_INT_CIRC_TYPE))))$
	Handover Success Rate	$100 * ((MSC_O_SUCC_HO + BSC_O_SUCC_HO + HO.CELL_SUCC_HO) / (MSC_O_HO_CMD + BSC_O_HO_CMD_ASSGN + BTS_HO_ASSGN))$
	TCH Availability	$100 * (((AVE_AVAIL_TCH_SUM / AVE_AVAIL_TCH_DEN) + (AVE_GPRS_CHANNELS_SUM / AVE_GPRS_CHANNELS_DEN) + (AVE_AVAIL_TCH_SUM / AVE_AVAIL_TCH_DEN) + (AVE_GPRS_CHANNELS_SUM / AVE_GPRS_CHANNELS_DEN)) / ((AVE_AVAIL_TCH_SUM / AVE_AVAIL_TCH_DEN) + (AVE_GPRS_CHANNELS_SUM / AVE_GPRS_CHANNELS_DEN) + (AVE_NON_AVAIL_TCH_TIMESLOT / NON_AVAIL_TCH_DENOM)))$
	Cell Availability	$100 * ((60 - (RESAVAIL.BCCH_DOWNTIME / 60)) / 60)$
3G	CSSR CS	$100 * [((moc_conv_call_atts) - (moc_conv_call_fails) + (mtc_conv_call_atts) - (mtc_conv_call_fails) + (emergency_call_atts) - (emergency_call_fails) - (RRC_ACC_REL_MO_CONV) - (RRC_ACC_REL_MT_CONV) - (RRC_ACC_REL_EMERGENCY)) / ((moc_conv_call_atts) + (mtc_conv_call_atts) + (emergency_call_atts) - (RRC_ATT_REP_MO_CONV) - (RRC_ATT_REP_MT_CONV) - (RRC_ATT_REP_EMERGENCY) - (RRC_ACC_REL_MO_CONV) - (RRC_ACC_REL_MT_CONV) - (RRC_ACC_REL_EMERGENCY))] * [((rab_acc_comp_cs_voice) / (rab_stp_att_cs_voice))]$

CSSR PS	$100 * [(moc_strea_call_atts - moc_strea_call_fails + mtc_strea_call_atts - mtc_strea_call_fails + moc_high_prior_sign_atts - moc_high_prior_sign_fails + mtc_high_prior_sign_atts - mtc_high_prior_sign_fails + moc_inter_call_atts + moc_backg_call_atts - moc_inter_call_fails - moc_backg_call_fails + mtc_inter_call_atts + mtc_backg_call_atts - mtc_inter_call_fails - mtc_backg_call_fails - RRC_ACC_REL_INTERACTIVE - RRC_ACC_REL_MO_BACKGROUND - RRC_ACC_REL_MO_HIGH_PR_SIGN - RRC_ACC_REL_MO_INTERACTIVE - RRC_ACC_REL_MT_BACKGROUND - RRC_ACC_REL_MT_HIGH_PR_SIGN - RRC_ACC_REL_MO_STREAMING - RRC_ACC_REL_MT_STREAMING + RRC.DENOM_ST_TRANS_TIME_PCH_FACH) / (RRC.ATT_PCH_TO_FACH + moc_inter_call_atts + moc_backg_call_atts + moc_strea_call_atts + moc_high_prior_sign_atts + mtc_inter_call_atts + mtc_backg_call_atts + mtc_strea_call_atts + mtc_high_prior_sign_atts - RRC_ACC_REL_INTERACTIVE - RRC_ACC_REL_MO_BACKGROUND - RRC_ACC_REL_MO_HIGH_PR_SIGN - RRC_ACC_REL_MO_INTERACTIVE - RRC_ACC_REL_MO_STREAMING - RRC_ACC_REL_MT_BACKGROUND - RRC_ACC_REL_MT_STREAMING - RRC_ACC_REL_MT_HIGH_PR_SIGN)] * [(rab_acc_comp_ps_inter) + (RRC.DENOM_ST_TRANS_TIME_PCH_FACH) + (SERVLEV.rab_acc_comp_ps_backg)] / [(rab_stp_att_ps_inter) + (RRC.ATT_PCH_TO_FACH) + (SERVLEV.RAB_STP_ATT_PS_BACKG)]]$
DCR CS	$100 * [(rab_act_rel_cs_voice_p_emp) + (rab_act_fail_cs_voice_iu) + (rab_act_fail_cs_voice_radio) + (rab_act_fail_cs_voice_bts) + (rab_act_fail_cs_voice_iur) + (rab_act_fail_cs_voice_rnc) + (RAB_ACT_FAIL_CS_VOICE_UE) + (RAB_ACT_FAIL_CS_VOICE_TRANS)] / [(rab_act_comp_cs_voice) + (rab_act_rel_cs_voice_srnc) + (rab_act_rel_cs_voice_p_emp) + (RAB_ACT_REL_CS_VOICE_HHO) + (RAB_ACT_REL_CS_VOICE_ISHO) + (RAB_ACT_REL_CS_VOICE_GANHO) + (rab_act_fail_cs_voice_iu) + (rab_act_fail_cs_voice_radio) + (rab_act_fail_cs_voice_bts) + (rab_act_fail_cs_voice_iur) + (rab_act_fail_cs_voice_rnc) + (RAB_ACT_FAIL_CS_VOICE_UE) + (RAB_ACT_FAIL_CS_VOICE_TRANS)]]$
DCR PS	$100 * [(RAB_ACT_FAIL_PS_BACKG_TRANS) + (RAB_ACT_FAIL_PS_INTER_TRANS) + (rab_act_fail_ps_inter_iu) + (rab_act_fail_ps_inter_radio) + (rab_act_fail_ps_inter_bts) + (rab_act_fail_ps_inter_iur) + (rab_act_fail_ps_inter_rnc) + (rab_act_fail_ps_backg_iu) + (rab_act_fail_ps_backg_radio) + (rab_act_fail_ps_backg_bts) + (rab_act_fail_ps_backg_iur) + (rab_act_fail_ps_backg_rnc) + (RAB_ACT_FAIL_PS_BACKG_UE) + (RAB_ACT_FAIL_PS_INTER_UE) - (RAB_ACT_FAIL_PS_BACKG_PCH) - (RAB_ACT_FAIL_PS_INT_PCH)] / [(rab_act_comp_ps_inter) + (rab_act_comp_ps_backg) + (rab_act_rel_ps_inter_srnc) + (RAB_ACT_REL_PS_INTER_HHO) + (RAB_ACT_REL_PS_INTER_ISHO) + (rab_act_rel_ps_backg_srnc) + (RAB_ACT_REL_PS_BACKG_HHO) + (RAB_ACT_REL_PS_BACKG_ISHO) + (rab_act_fail_ps_inter_iu) + (rab_act_fail_ps_inter_radio) + (rab_act_fail_ps_inter_bts) + (rab_act_fail_ps_inter_iur) + (rab_act_fail_ps_inter_rnc) + (rab_act_fail_ps_backg_iu) + (rab_act_fail_ps_backg_radio) + (rab_act_fail_ps_backg_bts) + (rab_act_fail_ps_backg_iur) + (rab_act_fail_ps_backg_rnc)]]$

		$\text{rnc})+(\text{RAB_ACT_FAIL_PS_BACKG_UE})+(\text{RAB_ACT_FAIL_PS_INTER_UE})+(\text{RAB_ACT_FAIL_PS_INTER_TRANS})+(\text{RAB_ACT_FAIL_PS_BACKG_TRANS})-(\text{RAB_ACT_FAIL_PS_BACKG_PCH})-(\text{RAB_ACT_FAIL_PS_INT_PCH}))]$
	RAB SSR CS	$100 * [((\text{rab_acc_comp_cs_voice}) / (\text{rab_stp_att_cs_voice}))]$
	RAB SSR PS	$100 * [((\text{rab_acc_comp_ps_inter}) + (\text{RRC.DENOM_ST_TRANS_TIME_PC_H_FACH}) + (\text{SERVLEV.rab_acc_comp_ps_backg})) / ((\text{rab_stp_att_ps_inter}) + (\text{RRC.ATT_PCH_TO_FACH}) + (\text{SERVLEV.RAB_STP_ATT_PS_BACKG}))]$
	RRC Congestion	$\text{RRC_CONN_STP_FAIL_AC_UL} + \text{RRC_CONN_STP_FAIL_AC_DL} + \text{RRC_CONN_STP_FAIL_AC_COD} + \text{PS_SETUP_FAIL_AC_DL_NRT} + \text{PS_SETUP_FAIL_AC_UL_NRT} + \text{PS_SETUP_FAIL_AC_COD_NRT}$
	CS RAB Congestion	$\text{RAB_STP_FAIL_CS_VOICE_AC_UL} + \text{RAB_STP_FAIL_CS_VOICE_AC_DL} + \text{RAB_STP_FAIL_CS_VOICE_AC_COD}$
	Soft Handover Success Rate	$100 * [(\text{succ_updates_on_sho_for_rt} + \text{succ_updates_on_sho_for_nrt}) / (\text{cell_add_req_on_sho_for_rt} + \text{cell_del_req_on_sho_for_rt} + \text{cell_repl_req_on_sho_for_rt} + \text{cell_add_req_on_sho_for_nrt} + \text{cell_del_req_on_sho_for_nrt} + \text{cell_repl_req_on_sho_for_nrt})]$
	Cell Availability	$100 * [(\text{avail_wcell_in_wo_state}) / (\text{avail_wcell_exists_in_rnw_db} - \text{avail_wcell_blocked_by_user})]$
4G	RRC Connection Setup Success Rate	$\text{RCC Con SSR} = (\text{RRC connection setup completions} / \text{RRC connection requests}) * 100\%$ $100 * \text{sum}([\text{M8013C5}]) / \text{sum}([\text{M8013C17}] + [\text{M8013C18}] + [\text{M8013C19}] + [\text{M8013C21}] + [\text{M8013C31}] + [\text{M8013C34}] + [\text{M8013C93}] + [\text{M8013C91}])$
	E-RAB Setup Success Rate	$(100 * \text{sum}([\text{EPS_BEARER_SETUP_COMPLETIONS}]) / \text{sum}([\text{EPS_BEARER_SETUP_ATTEMPTS}]))$
	Accessibility (SSSR %)	$\text{Accessibility (SSSR \%): RRC Connection Setup Success Rate} * \text{E-RAB Setup Success Rate}$ $\text{Accessibility (SSSR \%)} = [(\text{RRC connection setup completions} / \text{RRC connection requests}) * 100\%$ $100 * \text{sum}([\text{M8013C5}]) / \text{sum}([\text{M8013C17}] + [\text{M8013C18}] + [\text{M8013C19}] + [\text{M8013C21}] + [\text{M8013C31}] + [\text{M8013C34}] + [\text{M8013C93}] + [\text{M8013C91}]) * [(100 * \text{sum}([\text{EPS_BEARER_SETUP_COMPLETIONS}]) / \text{sum}([\text{EPS_BEARER_SETUP_ATTEMPTS}]))]$

Intra-Frequency Handover Out Success Rate	$(100 * \text{sum}([\text{SUCC_INTRA_ENB_HO}] + [\text{SUCC_INTER_ENB_HO}] + [\text{INTER_ENB_S1_HO_SUCC}] - [\text{HO_INTFREQ_SUCC}]) / \text{sum}([\text{ATT_INTRA_ENB_HO}] + [\text{ATT_INTER_ENB_HO}] + [\text{INTER_ENB_S1_HO_ATT}] - [\text{HO_INTFREQ_ATT}])))$
Inter-Frequency Handover Out Success Rate	$(100 * \text{sum}([\text{HO_INTFREQ_SUCC}]) / \text{sum}([\text{HO_INTFREQ_ATT}]))$
CSFB Preparation Success Rate (%)	$100 * ((\text{UE_CTX_SETUP_SUCC_CSFB} + \text{UE_CTX_MOD_SUCC_CSFB}) / (\text{UE_CTX_SETUP_ATT_CSFB} + \text{UE_CTX_MOD_ATT_CSFB}))$
Service Call drop rate	$(100 * \text{sum}([\text{ERAB_REL_HO_PART}] + [\text{ERAB_REL_ENB}] - [\text{ERAB_REL_ENB_RNL_INA}] - [\text{ERAB_REL_ENB_RNL_RED}] - [\text{ERAB_REL_ENB_RNL_PREEM}] - [\text{ERAB_REL_TEMP_QCI1}] + [\text{ERAB_REL_ENB_INI_S1_GLOB_RESET}] + [\text{ERAB_REL_ENB_INI_S1_PART_RESET}] + [\text{ERAB_REL_S1_OUTAGE}]) / \text{sum}([\text{ERAB_REL_ENB}] + [\text{ERAB_REL_HO_PART}] + [\text{EPC_EPS_BEARER_REL_REQ_NORM}] + [\text{EPC_EPS_BEARER_REL_REQ_DETACH}] + [\text{EPC_EPS_BEARER_REL_REQ_RNL}] + [\text{EPC_EPS_BEARER_REL_REQ_OTH}] + [\text{ERAB_REL_EPC_PATH_SWITCH}] - [\text{ERAB_REL_TEMP_QCI1}] + [\text{ERAB_REL_SUCC_HO_UTRAN}] + [\text{ERAB_REL_SUCC_HO_GERAN}] + [\text{ERAB_REL_ENB_INI_S1_GLOB_RESET}] + [\text{ERAB_REL_MME_INI_S1_GLOB_RESET}] + [\text{ERAB_REL_ENB_INI_S1_PART_RESET}] + [\text{ERAB_REL_MME_INI_S1_PART_RESET}] + [\text{ERAB_REL_S1_OUTAGE}])))$
E-Utran UE DL Throughput (kbps)	$\text{sum}([\text{IP_TPUT_VOL_DL_QCI_5}] + [\text{IP_TPUT_VOL_DL_QCI_6}] + [\text{IP_TPUT_VOL_DL_QCI_7}] + [\text{IP_TPUT_VOL_DL_QCI_8}] + [\text{IP_TPUT_VOL_DL_QCI_9}]) / \text{sum}([\text{IP_TPUT_TIME_DL_QCI_5}] + [\text{IP_TPUT_TIME_DL_QCI_6}] + [\text{IP_TPUT_TIME_DL_QCI_7}] + [\text{IP_TPUT_TIME_DL_QCI_8}] + [\text{IP_TPUT_TIME_DL_QCI_9}])$
E-Utran UE UL Throughput (kbps)	$((\text{IP_TPUT_VOL_UL_QCI_5} + \text{IP_TPUT_VOL_UL_QCI_6} + \text{IP_TPUT_VOL_UL_QCI_7} + \text{IP_TPUT_VOL_UL_QCI_8} + \text{IP_TPUT_VOL_UL_QCI_9}) / ((\text{IP_TPUT_TIME_UL_QCI_5} + \text{IP_TPUT_TIME_UL_QCI_6} + \text{IP_TPUT_TIME_UL_QCI_7} + \text{IP_TPUT_TIME_UL_QCI_8} + \text{IP_TPUT_TIME_UL_QCI_9}))) * 100$

Cell Availa bility	$(100 * \text{sum}([\text{SAMPLES_CELL_AVAIL}]) / \text{sum}([\text{DENOM_CELL_AVAIL}]))$
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